# \*\*OTEC Affirmative\*\*

## Adv: Aquaculture

### Aquaculture Adv: 1AC

**OTEC provides optimal technology for domestic aquaculture production – deep-ocean chemicals, low temperatures, and pathogen free water – this solves worldwide food scarcity**

Websdale Communications Support Officer at The Wildlife Trusts 2/24/14 (Emma Websdale, “The Promise of OTEC Aquaculture,” Empower the Ocean, http://empowertheocean.com/otec-aquaculture/) LR

Due to the technology’s looped system, under certain conditions the water can be re-used for secondary applications including desalination to create fresh drinking water. **One particularly attractive by-product of OTEC plants is nutrient-rich and virtually pathogen-free water from the deep ocean. This water provides an optimal environment for various forms of aquaculture cultivation of both plants and animals.** Through open-ocean fish farming (where adequate flushing ensures dilution of waste products), aquaculture can produce sustainable food supplies. Thus, **OTEC provides an attractive application to the aquaculture industry, especially in the face of current declines in commercial fishing stocks. The cold, deep seawater, available as a result of producing renewable energy through OTEC technology has numerous advantages for aquaculture** systems:-**Rich in dissolved nitrogen, carbon and phosphorus, OTEC’s deep-ocean water contains chemicals that are essential for fish and plant growth.** -**The consistent low temperature of OTEC water provides opportunities to culture valuable cold-water organisms both in native environments and in the tropics. -The virtually pathogen-free water pumped by OTEC allows disease-free cultivation of sensitive organisms. Aquaculture via deep seawater is not just a theory or hopeful expectation**. The Natural Energy Laboratory of Hawaii Authority (NELHA) currently utilizes cold deep seawater for both mature and developing commercial aquaculture applications. NELHA already farms numerous seafood products including shrimp, lobster, oysters, abalone, tilapia, kampachi, flounder and salmon. Additionally, aquaculture at NELHA includes the growing of microalgae for pharmaceuticals or biofuels, thus providing aninput for **humanitarian and environmentally friendly** industries.Investment Opportunity **Aquaculture is both sustainable and achievable**. **With wild fish stocks disappearing at an all-time rate, aquaculture provides a solution for replenishing global fish populations and alleviating pressure on intensively over-fished wild stocks**.Moreover, OTEC aquaculture can provide self-sustaining food resources for tropical island communities, helping them to compete with foreign fishing industries.OTEC aquaculture can also strengthen local economies of small island developing states (SIDS), by creating job opportunities for local island residents. **As the global population edges towards nine billion by 2050, the opportunity for jobs in the aquaculture industry will continue to grow**. This economic impact doesn’t stop with island communities. Aquaculture can also extend to ‘upstream’ industries including agriculture, hatcheries, feed manufacturers, equipment manufacturers, and veterinary services. ‘Downstream’ industries such as processors, wholesalers, retailers, transportation, and food services are also supported by the aquaculture industry**. Because OTEC plants can incorporate aquaculture services into their design, they will help to meet future fish demands – improving both food security and protection of dwindling wild fish populations. An investment into OTEC facilities is a smart one – it helps reduce the risk of global conflict over depleting food resources and enhances the livelihoods of the millions of people who depend upon our oceans.**

**Food crises will collapse civilization --- causes disease spread, terrorism, and economic collapse**

**Brown, 9** --- founder of both the WorldWatch Institute and the Earth Policy Institute (May 2009, Lester R., Scientific American, “Could Food Shortages Bring Down Civilization?” Ebsco)

**The biggest threat to global stability is the potential for food crises** in poor countries **to cause government collapse**. Those crises are brought on by ever worsening environmental degradation

One of the toughest things for people to do is to anticipate sudden change. Typically we project the future by extrapolating from trends in the past. Much of the time this approach works well. But sometimes it fails spectacularly, and people are simply blindsided by events such as today's economic crisis.

For most of us, the idea that civilization itself could disintegrate probably seems preposterous. Who would not find it hard to think seriously about such a complete departure from what we expect of ordinary life? What evidence could make us heed a warning so dire--and how would we go about responding to it? We are so inured to a long list of highly unlikely catastrophes that we are virtually programmed to dismiss them all with a wave of the hand: Sure, our civilization might devolve into chaos--and Earth might collide with an asteroid, too!

**For many years I have studied global agricultural, population, environmental and economic trends and their interactions. The combined effects of those trends and the political tensions they generate point to the breakdown of governments and societies.** Yet I, too, have resisted the idea that **food shortages could bring down** not only individual governments but also **our global civilization**.

I can no longer ignore that risk. Our continuing failure to deal with the environmental declines that are undermining the world food economy--most important, falling water tables, eroding soils and rising temperatures--forces me to conclude that such a collapse is possible.

The Problem of Failed States

**Even a cursory look at the vital signs of our current world order lends unwelcome support to my conclusion.** And those of us in the environmental field are well into our third decade of charting trends of environmental decline without seeing any significant effort to reverse a single one.

In six of the past nine years **world grain production has fallen short of consumption**, forcing a steady drawdown in stocks. When the 2008 harvest began, world carryover stocks of grain (the amount in the bin when the new harvest begins) were at 62 days of consumption, a near record low. In response, world grain prices in the spring and summer of last year climbed to the highest level ever.

**As demand for food rises faster than supplies are growing, the resulting food-price inflation puts severe stress on the governments of countries already teetering on the edge of chaos. Unable to buy grain or grow their own, hungry people take to the streets.** Indeed, even before the steep climb in grain prices in 2008, the number of failing states was expanding [see sidebar at left]. Many of their problem's stem from a failure to slow the growth of their populations. But **if the food situation continues to deteriorate, entire nations will break down at an ever increasing rate**. We have entered a new era in geopolitics. **In the 20th century the main threat to international security was superpower conflict; today it is failing states.** It is not the concentration of power but its absence that puts us at risk.

**States fail when national governments can no longer provide** personal security, **food security** and basic social services such as education and health care. They often lose control of part or all of their territory. When governments lose their monopoly on power, law and order begin to disintegrate. After a point, countries can become so dangerous that food relief workers are no longer safe and their programs are halted; in Somalia and Afghanistan, deteriorating conditions have already put such programs in jeopardy.

**Failing states are of international concern because they are a source of terrorists, drugs, weapons and refugees, threatening political stability everywhere.** Somalia, number one on the 2008 list of failing states, has become a base for piracy. Iraq, number five, is a hotbed for terrorist training. Afghanistan, number seven, is the world's leading supplier of heroin. Following the massive genocide of 1994 in Rwanda, refugees from that troubled state, thousands of armed soldiers among them, helped to destabilize neighboring Democratic Republic of the Congo (number six).

**Our global civilization depends on a functioning network of politically healthy nation-states to control the spread of infectious disease, to manage the international monetary system, to control international terrorism and to reach scores of other common goals. If the system for controlling infectious diseases**--such as polio, SARS or avian flu--breaks down, **humanity will be in trouble. Once states fail, no one assumes responsibility for their debt to outside lenders. If enough states disintegrate, their fall will threaten the stability of global civilization itself.**

#### Reliance on seafood imports will wreck the domestic seafood industry which is key to the overall economy. The only suitable alternative is self-sufficient national production.

Corbin, 10 --- President of Aquaculture Planning & Advocacy LLC (May/ June 2010, John S., Marine Technology Society Journal, “Sustainable U.S. Marine Aquaculture Expansion, a Necessity,” ingentaconnect database, JMP)

WHY U.S. MARINE AQUACULTURE DEVELOPMENT IS IMPORTANT

Seafood Consumption in America Today

**Americans have a growing preference for including seafood of all types in their diets** (Johnson, 2009). **The U.S. population increased from 225 million in 1980 to 302 million in 2008. During that time period, per capita seafood consumption**3 **increased 28% overall and 49% for the fresh and frozen product forms** (Table 1) (National Marine Fisheries Service [NMFS], 2009a). A recent seafood survey showed that 65% of U.S. households purchased seafood for at-home consumption at least once in the previous year, whereas 83% of households purchased seafood in a restaurant (NMFS, 2009b).

Fully 60% of all seafood products sold were in the fresh and frozen forms (National Fisheries Institute, 2009). Studies show that Americans are seeking the fresh product form, with 43% of households purchasing fresh seafood products each year (Frey, 2008). The top 10 freshwater and marine species eaten in 2008 on a per capita basis were shrimp, canned tuna, salmon, pollack, tilapia, catfish, crab, cod, flatfish, and clams (National Fisheries Institute, 2009). Notably, three of these species have substantial global marine aquaculture production bases, that is, shrimp, salmon, and clams (NMFS, 2009a). Moreover, **growth in per capita consumption in recent years occurred almost exclusively among the aquacultured species** (Anderson and Shamshak, 2008).

A significant number of consumers eat seafood at the high-end, white table cloth restaurant segment of the food service industry. Although not all serve seafood, the National Restaurant Association (2009) numbers commercial establishments at 945,000 nationwide, with 2009 sales at $566 billion. U.S. consumers spent an estimated $46.8 billion in 2008 for fishery products in food service establishments (restaurants, carryouts, caterers, etc.). A substantial number of consumers also purchase products from traditional supermarket seafood counters, with the 2008 figure being $22.7 billion (NMFS, 2009a). In addition, data indicate that approximately 88% of all fresh seafood sales occur in traditional supermarkets. Fresh seafood consists of shellfish (59% of dollar value) and finfish (41% of dollar value). Both categories grew in 2007 sales, 4.6% and 3.7%, respectively, over 2006 values. More demonstrative, baseline sales for seafood suppliers grew 8% in the same period and represented 90% of seafood department dollars, indicating that consumers are buying seafood as an everyday purchase (Frey, 2008).

Seafood consumers in general represent a cross section of the population. However, recent studies have shown that older adults, that is, the 70 million maturing “baby boomers,” eat significantly more seafood than other age groups. Adults 50–64 years of age eat 35% more seafood than the national average, and adults over 65 eat 53% more. Moreover, certain ethnic groups favor seafood; Hispanics consume 24% more than non-Hispanics and represent the largest ethnic group in the United States at 38 million members (Johnson, 2009), and Asian Americans, which represent 5% of the population, have strong preferences for fresh seafood products (NMFS, 2009b).

Farmed seafood provides the food service industry and consumers in general several much sought after characteristics, including predictable and consistent supply, greater portion control, and enhanced freshness, quality, and traceability. Among the major reasons Americans are seeking out seafood today is the associated health benefits of consuming the high-quality aquatic proteins and long chain omega-3 fatty acids (eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA]) present in the products. Studies indicate that these chemicals can improve cellular function, brain, and nervous system function, and cardiovascular health (Nesheim and Yaktine, 2007). Other reasons for the increasing popularity of seafood relate to the food service industry’s development of a wide variety of value-added, easy-to-prepare seafood products and the recent supermarket trend toward self-service seafood departments supplied with prepackaged, case-ready products (Johnson, 2009).

The October 2009 survey of chefs by the American Culinary Federation further supports the trend for greater seafood consumption. The feedback on the “hottest menu trends in 2010” indicated that the top restaurant theme was purchase of locally sourced produce, meat, and seafood. Next was sustainability of production techniques to address the “greening” of the American consciousness. Also mentioned as highly popular were the seafood-related themes of using organically grown products and nontraditional fish (National Restaurant Association, 2009).

These strong indicators among food and food service providers and their customers underscore the U.S. consumer’s growing desire for sustainably and locally produced seafood. Additional evidence of seafood’s importance is the increasing use of ecolabeling by environmental and industry groups (e.g., World Wildlife Fund, the Global Aquaculture Alliance, the Marine Stewardship Council) to influence consumer behavior and to promote selection of sustainably produced seafood products (World Wildlife Fund, 2009; Global Aquaculture Alliance, 2009; Marine Stewardship Council, 2009; Anderson and Shamshak, 2008; FAO, 2009b). Further, there is a growing number of “seafood choice” cards (e.g., the Monterey Bay Aquarium and the Georgia Aquarium) to help consumers identify best and worst seafood choices based on the sustainability of the source (Monterey Bay Aquarium, 2009; Georgia Aquarium, 2009).

SEAFOOD SUPPLY IN AMERICA TODAY

Annual U.S. seafood consumption (capture and culture sources) of edible fishery products (domestic commercial landings + imports − exports = total consumption) has varied from 4.3 mmt (9,532 million pounds) to 5.7 mmt (12,492 million pounds) round weight4 between 1999 and 2008 (Table 2). The tendency was toward increasing values with 5.4 mmt (11,836 million pounds) consumed in 2008. For visual reference, a metric ton is approximately equivalent in size to a rectangle 4 feet (1.2 meters) wide, 4 feet (1.2 m) long, and 5 feet (1.5 m) high, and a million metric tons is estimated to be equivalent to 251 American football fields covered one layer deep with standard 40 feet (12.2 m) shipping containers filled to maximum load.5

Domestic commercial fishery landings also varied over the same time frame from a low of 3.0 mmt (6,633 million pounds) in 2008 to a high of 3.6 mmt (7,997 million pounds) in 2005. Notably, the United States exports significant amounts of edible seafood: values between 1999 and 2008 varied between a low of 1.9 mmt (4,129 million pounds) in 1999 to 2.9 mmt (6,462 million pounds) in 2004, with the major recipients being China, Japan, and Canada. Edible seafood imports, however, have increased every year from a low of 3.5 mmt (7,630 million pounds) in 1999 to a high of 4.9 mmt (10,763 million pounds) in 2007, until a slight decline in 2008 when the value was 4.8 mmt (10,456 million pounds) (NMFS, 2009a)

Recent reports indicate that **84% of U.S. seafood consumption is imported** (NMFS, 2009b). In 2008, imports of edible fishery products were valued at a record $14.2 billion. This included 4.4 billion pounds in the fresh and frozen product forms, valued at $12.1 billion. These imports included shrimp products valued at $4.1 billion, salmon valued at $1.6 billion, and tuna valued at $601 million. Nonedible fishery products imported by the industry for fish meal, oils, etc., in the same year were valued at an additional $14.3 billion. Thus, the contribution of imports to U.S. fisheries product needs in 2008 was $28.5 billion (NMFS, 2009a).

**In 2007, the** **U**nited **S**tates **replaced Japan, the long-time leader, as the world’s leading importer of fishery products**. Notably, Japan has the highest per capita seafood consumption of any developed country at 59.3 kg (131 lb) per person or eight times that of the United States (NMFS, 2009a). Moreover, **the seafood balance of trade deficit was over $10 billion in 2007, an increase of almost 60% from $6.8 billion in 1998** (ERS, 2009). Major 2008 source countries for seafood imports by volume included China 22%, Thailand 15%, Canada 13%, Indonesia 6%, Chile 5%, Viet Nam 5%, and Ecuador 4% (NMFS, 2009a).

Domestic aquaculture’s total (freshwater and marine) contribution to U.S. seafood supplies has risen, more or less steadily, in production volume from 135,747 mt (300 million pounds) in 1983 to 417,647 mt (923 million pounds), valued at $1.2 billion in 2003 (NMFS,2009a). In recent years (2004 to 2007), growth has been erratic due in large part to rising competition with lower priced foreign imports (Forster and Nash, 2008). Values ranged between a low of 362 mmt (800 million pounds) in 2006 and a high of 408 mmt (906 million pounds) in 2004, although product value has tended to increase (Table 3).

By contrast, global aquaculture production between 2004 and 2007 increased 20%, from 41.9 mmt (92.6 billion pounds) to 50.3 mmt (111 billion pounds), valued at $70 billion (NMFS, 2009a). Global aquaculture now provides 50% of edible seafood for the world population (FAO, 2009b) on the basis of the culture of more than 300 aquatic species (Leung et al., 2007). Comparatively, **America was the third largest consumer of seafood in the world by volume, behind China and Japan, but has steadily dropped to 13th in volume production from aquaculture, as countries such as China, India, Thailand, Viet Nam, and Indonesia invest in expansion of their industries** (FAO, 2009c). U.S. aquatic farming provided just 7.2% of domestic demand in 2007, mostly freshwater catfish and trout (National Oceanic and Atmospheric Administration [NOAA], 2008).

Focusing on the marine aquaculture component of U.S. production—mostly made up of salmon, oysters, clams, mussels, and shrimp—the annual wholesale value is around $200 million or less than 20% of the total industry value. Marine aquaculture today provides only 1.5% of U.S. seafood supply (NOAA, 2008). Seafood imports clearly dominate U.S. supplies, and estimates indicate that 50% of imports are farmed, mostly in developing countries, for example, China, Thailand, and Indonesia (NOAA, 2008; NMFS, 2009a).

Overall, this discussion indicates that **the U.S. seafood economy** (capture and culture products and raw materials) **in total makes a significant direct economic impact on American commerce each year, even without taking into account the economic impacts of secondary industries** (e.g., seafood wholesalers and retailers, transportation and storage providers, harbor support facilities providers, etc.). The total value of exported (edible and nonedible) fishery products plus the total value of imported products was $51.9 billion in 2008. From another perspective, domestic fishery landings and aquaculture production (freshwater and marine sources) had an estimated value of $5.4 billion in 2008 (NMFS, 2009a).

The contribution of marine recreational fishing to providing fish for the American diet should not be overlooked in a discussion of seafood supply. In 2008, almost 12 million anglers spent $30 billion on nearly 85 million marine recreational fishing trips on the Atlantic, Gulf, and Pacific Coasts. The total marine catch was conservatively estimated at nearly 464 million fish, of which almost 58% were released. Total harvest weight was estimated at 112,217 mt (248 million pounds), which would have had a disproportionately higher impact on the diets of residents of coastal states where the fishing activity occurred (NMFS, 2009a) and where 50% of the U.S. population lives within 80 km (50 miles) of the coast (U.S. Commission on Ocean Policy [USCOP], 2004).

It is relevant to note that of the top 10 recreational species in 2008, seven (striped bass, spotted sea trout, yellow fin tuna, red drum, dolphin fish, summer flounder, and black drum) are among the targets of public sector, private sector, and university aquaculture research or fledgling marine stock enhancement efforts (NMFS, 2009a; NOAA, 2009a). Marine stock enhancement of recreational and commercial fisheries is in the process of being recognized as a valuable tool for fisheries managers. More robust domestic coastal and ocean fisheries could add significantly to seafood supplies and expand the economy while helping preserve America’s long and cherished cultural heritage in fishing (USCOP, 2004).

PROJECTED U.S. SEAFOOD DEMAND

Global Context

**Filling America’s future seafood requirements by a greater reliance on imports should be considered in the context of global seafood supply and demand projections as well as potential market forces.** Aquaculture has been the fastest growing segment of world food production, expanding an average of 9% per year since 1950, although the rate has been slowing in recent years. Marine capture fisheries supplies—roughly 90% of the total supplies from fisheries, with the balance from inland fisheries—began to level off in the late 1980s at around 90 mmt (198 billion pounds) per year. Since then, virtually all increases in seafood supplies have been through expansion of freshwater and marine aquaculture, with marine farming contributing roughly 38% or 19 mmt (41 billion pounds) in 2006 (FAO, 2009b).

**As the global human population grows, demand for aquatic protein will most certainly increase because of the critical contribution of seafood to the diets of the developed and developing countries around the world** (FAO, 2009b). Demand projections vary with time frame and amounts, but all conclude that much more supply will be needed and future increases must come from aquaculture in all its forms. One study indicates that just to maintain current levels of worldwide per capita consumption, aquaculture will need to reach 80 mmt (176.8 billion pounds) by 2050 or 60% more than its present amount (FAO, 2003). Other estimates forecast a potential increase in world per capita consumption from 16 kg (35.4 lb) to 21 kg (46.4 lb) and 2.3 billion additional people, requiring an additional 40 mmt (88.4 billion pounds) to 60 mmt (132.6 billion pounds) from aquaculture production by 2030 (Silva, 2001). A more urgent world seafood demand projection is provided by Delgado et al. (2003), who forecast the need for between 68.6 mmt (151 billion pounds) and 83.6 mmt (184 billion pounds) from aquaculture production by 2020, which translates to between 18.3 mmt (40 billion pounds) and 33 mmt (72.8 billion pounds) more than 2007 supplies in just 13 years (NMFS, 2009a).

Importantly, these authors also question if meeting increases in supplies through greater aquaculture production is possible, with the existing trends in development, resource use, and technology intensification in the global industry (Delgado et al., 2003; FAO, 2009b). Their skepticism seems warranted upon further consideration; for example, an aquaculture production increase between 18.3 and 33 mmt in 13 years would mean an expansion of almost 1 to 1.5 times the size of the salmon industry in 2006 (volume at 1.65 mmt or 3.64 million pounds) in each of the next 13 years. A daunting task at best! Notably, the global salmon aquaculture industry took over 20 years to grow from 80 thousand metric tons (tmt) (17.6 million pounds) to 1.65 mmt in 2006 (Asche and Tveteras, 2009).

U.S. Projections

**Future U.S. seafood demand has several important drivers going forward, namely, projected population growth and the continued and growing popularity of seafood** as a protein choice by consumers, due in large part to trends in buying locally, seeking variety, and eating for better health.

The U.S. population is expected to grow from 302 million people in 2008 to 341 million people in 2020 and 374 million in 2030 (U.S. Census Bureau, 2009). Using the 2008 consumption value of 7.2 kg (16 lb) per person and a current national consumption figure of approximately 2.17 mmt (4,896 million pounds of edible weight2) per year as a benchmark, the necessary seafood supply just to maintain the 2008 per capita value would be 2.46 mmt (5,437 million pounds) in 2020 and 2.69 mmt (5,945 million pounds) in 2030.

Taking into account the increasing popularity of seafood, particularly among certain demographics, projected demand could be even higher. For example, the American Heart Association has advocated that Americans should eat seafood twice a week rather than the current average of once a week, and this would increase current demand by 0.68 mmt (1.5 billion pounds) (USCOP, 2004). Recent estimates indicate that by 2020, per capita consumption values could increase from 7.2 kg (16 lb) to 8.6 kg (19 lb) (Anderson and Shamshak, 2008). The increases in population and per capita consumption could push the amount of seafood needed to 2.93 mmt (6,475 million pounds) in 2020 and 3.33 mmt (7,359 million pounds) in 2030 or 1 mmt more than today.

**The American seafood production, processing, and distribution industry and its political supporters and retail customers are facing a critical choice to meet projected demand. Either expand sustainable domestic sources of seafood through greater aquaculture production and greater fisheries management, restoration, and enhancement activities or rely further on imports, largely from developing countries.**

UNCERTAINTIES IN MEETING FUTURE U.S. SEAFOOD DEMAND

It is important to examine some critical issues, other than basic global seafood supply, that are related to the potential long-term sustainability and stability of the U.S. option of importing substantial amounts of seafood over the next two decades. **Anderson and Shamshak** (2008) **provide valuable insight into the complexity, instability, and far-reaching impacts of the global seafood industry**. They characterize the industry as follows:

The global seafood industry is the most complex and diverse animal protein sector, with over 800 species traded, ranging from urchins to oysters to swordfish. The industry uses harvesting technologies that date back thousands of years as well as capture and culture technologies that are among the most advanced in the world.

International trade in seafood is valued at more than twice the trade in all other meats and poultry combined.

The industry is fragmented with tens of thousands of companies spread around the world.

The industry faces the most bureaucratic and inefficient regulatory environment, relative to any other food sector.

Capture fisheries are known to waste significant resources through by-catch and inefficient processing. Moreover, the industry throughout its history has often been plagued with excess capacity, overcapitalization, and/or regulated inefficiency.

Seafood is traded in a global marketplace that lacks transparency. Accurate and timely information about prices and market conditions is difficult to obtain or nonexistent.

The authors conclude that, **“All these factors result in a seafood sector which is highly volatile compared with other animal protein sectors. The factors above undermine efficiency, market planning, and market development.”**

In addition to the potentially disruptive factors mentioned above, which are likely to continue for the foreseeable future, **there are other important reasons why maintaining U.S. accessibility to adequate seafood imports may be viewed as a “risky proposition” over the long term.** Strategically, the important supply question is: Could the adequacy of seafood supplies from imports, in what already is a volatile global marketplace, be jeopardized by the anticipated increases in regional competition for product, the growth of mega cities in seafood source regions, China’s dominance in the seafood trade, and the increasing likelihood of unforeseen geopolitical events and disputes?

**Fishery products are essential commodities for both developing and developed countries, and regional competition for seafood sources can be expected to increase in the decades to come.** Per capita aquatic protein consumption globally has been rising the last few decades, with estimates for 2006 at 16.7 kg (35.9 lb). Importantly, fish today provide more than 3 billion people with 15% or more of their annual animal protein consumption (FAO, 2009b).

Developing countries in the Asia-Pacific region accounted for approximately 79% of global fishery production in 2006 (capture and culture sources), and this value is expected to increase with time (FAO, 2009b). Japan, the United States, and the European Union are the major markets for their exports, with a significant total market share of 72% of the total 2006 value. With respect to aquaculture production alone, the Asia-Pacific region today produces 90% of the farmed food and 80% of the world value. The region’s dominance as a critical supplier of cultured products is expected to continue well into this century (FAO, 2009b).

**Several emerging trends in Asia could direct seafood supplies away from the export channels to the** **U**nited **S**tates, **that is, create a more competitive regional environment for products. The majority of the world’s population increase in the next 20 years will occur in the Asia-Pacific region, and it is anticipated that the regional cultures at all levels of the economic spectrum will maintain their preferences for seafood**; for example, per capita consumption amounts in higher income countries are expected to continue to grow. Rising standards of living, increasing incomes, and diversification of diets in selected parts of the region are expected to maintain and/or expand demand for seafood (FAO, 2009b). To illustrate, Asian countries, other than China, experienced an increase of 5.9 kg (13.0 lb) in per capita consumption between 2003 and 2007 (Johnson, 2008).

Another notable trend that will modify dietary patterns and influence the global distribution of seafood is the urbanization of the world population, that is, the movement of people into megacities located in Europe, Asia, Africa, and North and South America. In 2008, a milestone was reached when more of the world’s population lived in cities than in rural environments. By 2050, the urban population will double from 3.3 billion in 2007 to 6.4 billion or two thirds of the total projected world population of 9.2 billion. The majority of the growth will be absorbed by cities in lesser developing countries (FAO, 2009b).

City dwellers are projected to have greater wealth, increased dietary choices, and improved ability to pay for what they want. Further, as noted by FAO, efficiently providing quality fresh products to these urban markets usually requires production capacity being relatively nearby (FAO, 2009b). A scenario can be envisioned where regional aquaculture producers and fishers will want to preferentially serve markets in the megacities rather than serve distant export customers with lower value frozen products. This presumption is supported by recent U.S. import statistics that indicate over 75% of fish products entered the country frozen and from as far away as Asia, while fresh fish came from nearby countries in the Western Hemisphere (ERS, 2009).

The Peoples Republic of China’s rapid transition to a market-based economy has been extraordinary. The country’s focus on modernization and increasing world trade has made it the most influential nation in Asia and an important trading partner for American industry. China also has become a holder of significant amounts of U.S. currency (foreign exchange reserves) and national debt, both highly sensitive political issues (Naisbett and Naisbett, 2010).

**With respect to fishery products and seafood, China has become a dominant player in world markets, and the country will have a major, long-term influence on the production and distribution of seafood around the world** (Johnson, 2009). **Consider these statistics about China and the global seafood industry:**

**China was the largest producer of fisheries products in the world** in 2006 with a total of 46 mmt: 14.7 mmt (32.5 million pounds) from capture and 31.4 mmt (69.4 million pounds) from aquaculture. Total fishery products production is over six times the next leading country, India (NMFS, 2009a).

**China is the global leader in aquaculture production, supplying 67% of the world supply of fish and shellfish in 2006 and 49% of the value.**

From 1970 to 2006, China’s aquaculture production increased at an annual average of 11.2%. However, recently the growth rate has declined to 5.8% from 17.3% in the 1980s to 14.3% in the 1990s.

**Since 2002, China has been the world’s largest exporter of fish and fishery products, valued at $9.3 billion in 2007** (FAO, 2009b).

With respect to China’s growing direct influence on the U.S. seafood industry, consider these reported data (NMFS, 2009a):

Over the period 1998 to 2007, U.S. imports of fish and seafood from China increased from $289.5 million to $1.5 billion.

In 2008, China accounted for 22% of edible and nonedible fishery imports, valued at $4.1 billion.

In terms of edible fishery products imported in 2008, China accounted for over 523,000 mt, valued at $2.2 billion.

China received 19% of all U.S. fisheries product exports (edible and nonedible) valued at $2.5 billion.

**With China’s fundamental importance to global seafood supply and demand, not only to feed itself but also to supply major importing countries like the** **U**nited **S**tates, **it is disturbing that the United Nations FAO—the keeper of world fishery and aquaculture statistics—lacks confidence in China’s fishery statistics, particularly for aquaculture production. FAO stated in 2009, “There are continued indications that capture fisheries and aquaculture production statistics for China may be too high and the problem has existed since the early 90s.”** Chinese officials have recently indicated they are working to revise downward fishery and aquaculture statistics; for example, in 2008 China reported reduced total fishery and aquaculture production for 2006 of more than 10% (FAO, 2009b). **These glaring uncertainties have serious implications for the predictability and stability of future seafood imports to the** **U**nited **S**tates.

Finally, **the world’s seafood importers are largely supplied by developing countries that are inherently more vulnerable to the geopolitical events and bilateral and multilateral disputes common today. To underscore the inherent fragility of supplies, it is estimated that up to 75% of global aquaculture production comes from millions of small-scale farms, with the majority located in Asia** (FAO, 2009a). Further, **concerns currently exist that although Asian production has rapidly expanded, regulatory standards that ensure a basic level of compliance with feed additive usage are lagging behind; that is, small farmers are often not aware of common food safety issues** (Tan, 2009). For example, in 2007 the U.S. Food and Drug Administration announced broader import controls on all farm raised aquatic products from China due to residues from drugs not U.S. approved (OCA, 2009).

The FAO lists just some major recurring issues that can impact international trade in fishery products as follows (FAO, 2009a): (1) introduction by buyers and international retailers of private standards for food safety and quality, animal health, environmental sustainability, and social purposes; (2) trade disputes, for example, shrimp, salmon, and catfish.; (3) use of ecolabels and certification requirements by retailers; (4) expansion of regional trade areas and regional and bilateral trade agreements; and (5) rising energy prices and their impact on fisheries and aquaculture.

In summary, **the inevitable geopolitical tensions over national self-interest and global financial markets, trade, energy, human rights, and national security issues, et al., could frequently and substantially disrupt the flow of future seafood imports into the** **U**nited **S**tates, **with rapid and lasting negative consequences to the multibillion dollar, nationwide seafood economy**.

Futurists, such as Lester Brown, point to global food security as the weak link in successfully feeding the world’s growing population. He states, “Food security will deteriorate further unless leading countries collectively mobilize to stabilize population, stabilize climate, stabilize aquifers, conserve soils, and protect cropland” (Brown, 2009). **The inescapable conclusion is that future U.S. imports are vulnerable to major disruption as the world negotiates the challenges of achieving a sustainable 21st century society, given the importance of international trade in seafood; the questionable ability for Asian countries, particularly China, to meet production projections;** the growing pressures on the flow of products in global supply networks; and the dependency of developing countries on seafood for basic aquatic protein. **Increased seafood security, defined as self-sufficiency to maintain adequate supplies for domestic use, should be targeted as a critical policy issue for helping maintain a vibrant and diverse national economy, a healthy and productive ocean environment, and a robust quality of life for Americans.**

CONSIDERING U.S. OCEAN RESOURCES FOR DOMESTIC SEAFOOD PRODUCTION

The U.S. Ocean Resource

On March 10, 1983, President Reagan established by proclamation an EEZ for America.6 In effect, the EEZ designation puts all living and nonliving resources between 3 and 200 nautical miles from shore under the primary jurisdiction, management, and regulation of the federal government (USCOP, 2004).

**The U.S. EEZ is the largest of any nation and covers 11.7 million km2** (4.5 million square miles), **about 50% more than the total land mass of the lower 48 states** (Pew Oceans Commission, 2003). The area spans a diverse array of ecosystems from the frigid Arctic to tropical marine habitats in the Atlantic and Pacific oceans. The EEZ is subject to a myriad of critical uses that serve American society, including energy extraction, seafood harvesting, marine transportation, national defense, ocean recreation, and marine conservation. Although all these uses are highly significant, **its enormous size and great habitat diversity suggest that there are ample resources and space to enhance existing uses and, through proper planning and siting, develop critical new uses for** society, for example, wind energy and **open ocean aquaculture** (USCOP, 2004).

Both state marine waters, which encompass an estimated additional 84,000 km2 (32,500 miles2), and the EEZ are essential to the future of domestic seafood supplies for America. In 2008, fishery landings for edible and industrial products were 3.8 mmt (8.4 billion pounds) valued at $4.4 billion. Economic benefits of landings impact the Atlantic, Pacific, and Gulf coasts as well as Hawaii and the U.S. territories and flag islands. For example, Alaska led all states in value of landings with $1.7 billion, followed by Massachusetts at $400 million, Maine at $288 million, Louisiana at $273 million, and Washington at $250 million. There are 50 major U.S. ports where commercial fishery landings are significant, moving product volumes of between 4,545 and 455,000 mt (10 million and 1 billion pounds) that are valued at between $10 million and $300 million per year. These ports are located in 16 of 26 U.S. states and territories with ocean coasts. Moreover, the living resources in the EEZ were the source in 2008 for approximately 65% of all fishery landings in the United States (NMFS, 2009a).

**Currently, domestic marine aquaculture contributes less than 1.5% of U.S. seafood consumption**, and all production comes from coastal land sites and nearshore sites in state marine waters (Forster and Nash, 2008). The United States has no commercial open ocean farms in the EEZ at this time primarily because of the lack of a permitting process and leasing regime to grant and administer the property rights needed for the private sector to invest in offshore fish farming (Cicin-Sain, et al., 2005; NOAA, 2008). As other nations with ocean coasts (e.g., England, Ireland, Norway, and China) but less resource potential actively move commercial marine aquaculture into the open ocean (Ryan, 2004; James and Slaski, 2006; Watson and Drumm, 2007; FAO, 2009b), America has remained hesitant to move forward. This despite conservative estimates showing that less than 500 km2 (less than 0.01% of the U.S. EEZ) could produce up to 600,000 mt (1.33 billion pounds) or more of additional seafood (Nash, 2004). **Marine aquaculture proponents today highlight the huge size and incredible habitat diversity of the EEZ that offer a great opportunity to farm a wide range of economically important marine species for domestic markets and export** (Nash, 2004; USDOC, 2007; Forster, 2008).

FEDERAL AND CONGRESSIONAL EFFORTS TO EXPAND MARINE AQUACULTURE DEVELOPMENT

In 1999, the NOAA of the USDOC spearheaded efforts to expand the marine aquaculture industry and particularly to allow commercial farming in the EEZ. These efforts were catalyzed by an ambitious policy adopted by USDOC that framed the need and potential for aquaculture to contribute significantly to domestic seafood supplies by 2025 to include the following: (1) increase the value of domestic aquaculture production (freshwater and marine) from $900 million annually to $5 billion; (2) increase the number of jobs in aquaculture from 180,000 to 600,000; (3) enhance depleted wild fisheries stocks through aquaculture, thereby increasing the value of both commercial and recreational landings and improving the health of U.S. resources; and (4) increase exports of aquaculture goods and services from $500 million to $2.5 billion annually (USDOC, 1999).

Over the period 2004 to 2008, a national dialogue on ocean use and policy ensued, largely prompted by publication of comprehensive reports by the independent Pew Oceans Commission in 2003 and the USCOP in early 2004, followed by the Bush Administration’s U.S. Ocean Action Plan in December 2004. Important components of these discussions focused on the future of fisheries and the role of marine aquaculture in domestic seafood production and included a need for a lead federal agency for sustainable marine aquaculture, a designation of the USDOC with primary responsibility to ensure offshore aquaculture develops in an environmentally sustainable manner, and introduction by the Administration of the National Offshore Aquaculture Act of 2005 (S. 1195, although hearings were held in 2006 the bill did not pass), a preparation of a 10-year plan for the NOAA Aquaculture Program in 2007, and a submission of another offshore aquaculture bill, entitled “The National Aquaculture Act of 2007” (H.R. 2010 and S. 1609), but again after hearings in 2008, the bill did not pass (USCOP, 2004; Bush Administration, 2004; USDOC, 2007).

Real progress in national legislation to encourage commercial development has been limited. However, the constraints to and the opportunities for marine aquaculture were fully described, and a large community of stakeholders became better informed.

With President Obama’s election and the appointment of a new Administration in 2009, marine aquaculture and ocean farming in the EEZ are again topics of discussion. The President began developing an ocean agenda and appointed an Interagency Ocean Policy Task Force on June 12, 2009, charged with rapidly formulating a national policy for the ocean, the coasts, and the Great Lakes. Specifically, the task force was mandated to develop recommendations for a framework for improved federal policy coordination and an implementation strategy to meet objectives of a national ocean policy, all within 90 days. Further, within 180 days, the group was to develop a framework for coastal and marine spatial planning for federal and state ocean waters and the Great Lakes to support the development of a national ocean policy (Council on Environmental Quality [CEQ], 2009a, 2009b).

On September 10, 2009, the Ocean Policy Task Force released its interim report for public comment describing a national policy, modifications to the existing governance structure and nine categories of action (CEQ, 2009a, 2009b). Subsequently, the Ocean Policy Task Force released its required report on marine spatial planning, entitled “Interim Framework for Effective Coastal and Marine Spatial Planning” on December 9, 2009, for public comment. The report outlined an innovative, stakeholder-driven process through which the federal government will carry out more integrated planning and management of activities in America’s oceans and the Great Lakes and provides an ambitious 5-year timetable. Although the initial task force report barely mentions aquaculture, the spatial planning framework lists a range of 15 social, economic, and cultural uses for consideration, including aquaculture (fish, shellfish, and seaweed farming), commercial fishing, recreational fishing, ports and harbors, and traditional hunting, fishing, and gathering (CEQ, 2009b).

It will be important to marine aquaculture to see how the 2010 Congress prioritizes and supports this new comprehensive approach to ocean management. Meanwhile, other recent national actions have focused on actively moving marine aquaculture into the EEZ and are briefly highlighted:

In 2009, the Gulf Coast Regional Fisheries Management Council developed a permit and leasing process for commercial marine aquaculture in federal waters of the Gulf of Mexico that awaits implementation after further deliberation by NOAA to establish a policy for commercial farming in the EEZ. The effort included a comprehensive Programmatic Environmental Impact Statement and Management Plan (Gulf Coast Regional Fisheries Management Council, 2009).

Legislation (H.R. 4363) was submitted in December 2009 to establish a comprehensive regulatory framework and research program for offshore aquaculture development in the EEZ that balances environmental, social, and economic concerns and focuses on establishing a regulatory system; authorizing the Secretary of Commerce to determine appropriate locations, to permit, to regulate, to monitor, and to enforce offshore aquaculture activities; requiring the Secretary of Commerce to issue regulations and permits for offshore aquaculture to prevent and/or minimize impacts on the marine ecosystem and fisheries; and establishing a research program to guide the precautionary development of offshore aquaculture (Gov. track, 2009). The legislation awaits hearings at this writing.

NOAA announced in December 2009 that it will develop a comprehensive national policy for sustainable marine aquaculture in federal waters. The policy will enable domestic aquaculture, which adds to the U.S. seafood supply, supports important commercial and recreational fisheries, develops coordinated federal standards for permitting facilities in federal waters, and formulates strategies to provide the scientific information needed for permitting decisions. Stakeholder input will be sought in 2010 (NOAA, 2009b).

CURRENT ISSUES IN U.S. COMMERCIAL OFFSHORE MARINE AQUACULTURE DEVELOPMENT

National surveys documenting the changes in the number of farms and farm acreage in the U.S. aquaculture industry between 1998 and 2005 lead to several conclusions about the potential direction of future development (National Agricultural Statistics Service, 2000, 2006). Freshwater acreage is growing slowly, and future increases in production will largely come from intensifying production on existing land-based farms rather than major site expansions and building new farms. Nearshore marine farming (mainly bivalve shellfish) is increasing rapidly, and further expansion of commercial marine aquaculture into open ocean locations offers the greatest potential for large-scale growth because of less competition for use of resources and the large area available (Corbin, 2007a). Moreover, according to the USCOP, locating aquaculture activities further offshore will reduce conflicts over the visibility of facilities from land, be less intrusive to nearshore capture fisheries and recreational activities, and have fewer environmental impacts (USCOP, 2004).

Leasing federal waters for commercial aquaculture has been a controversial subject in recent years, raising a variety of issues for discussion and consensus building among opponents and proponents. Among the most difficult to address has been the potential for negative environmental impacts of large-scale marine farming in the open ocean setting of the EEZ. The most frequently mentioned concerns by opponents include escapes of farmed species and mixing with wild populations, disease and parasite management and the potential for infection of wild populations, use of fishmeal as a major protein source in fish feeds impacting the source fisheries, and pollution potential and the need for standards for acceptable change in the quality of the water column and substrate in and around farms (Lubchenko, 2003; MATF, 2007).

The research community and the industry have made significant efforts to study these recurring concerns and how they can be successfully managed. There have been documented positive reports of negligible environmental impacts from several multiyear offshore research and commercial marine farming projects in Hawaii, Puerto Rico, and New Hampshire, with combined operating experience of over 20 years (Aquaculture Planning and Advocacy, 2009; Kona Blue Water Farms, 2009; Alston et al., 2005; Langan, 2007). Proponents believe that the results from these projects, which include comprehensive environmental monitoring (e.g., water column and substrate quality, feeding and feed conversion, stock health and escapes), and others from around the world (Ryan, 2004) support the conclusion that the potential for negative environmental impacts from offshore and open ocean aquaculture is very manageable through proper siting and farm operation (e.g., application of well-known industry best management practices). It is suggested that sufficient empirical and scientific information exists to select open ocean sites with appropriate oceanographic conditions (e.g., sufficient current for mixing and substrate for anchoring) and operate a finite number of large-scale farms to demonstrate that today’s “off the shelf” technologies and available native-to-the-region species are scalable and can be sustainably managed. For example, work by Renzel et al. (2007) and the Scottish Association of Marine Science (2009) on modeling potential site impacts of ocean farming and by Nash et al. (2005) and Rust (2007) on ecological risk management can be highlighted for guidance.

What is lacking at this stage, according to the nascent industry, is application of this information to establish a workable interim permitting and leasing process for federal waters to allow the private sector to demonstrate large-scale commercial farming in interested regions. Model processes to base an interim EEZ permitting and leasing program for cage culture have been suggested for federal waters (Cicin-Sain et al., 2005) and are operating in state waters in Maine and Hawaii, which include environmental assessment of the site, stakeholder input, and environmental monitoring plans (MDMR, 2009; Corbin, 2007b). Using properly sited demonstration farms, such as the 24-cage fish culture project being proposed by Hubbs-SeaWorld Research Institute 5 miles offshore in the Southern California Bight (MCRI, 2008), federal agencies could require monitoring and collect information from operating farms. In consultation with affected agencies, states, industry, and the affected public, this information could be used to begin the process of promulgating standardized regulatory and leasing processes and environmental requirements, while nationwide integrated spatial planning is carried out for federal and state waters. In other words, a proactive, adaptive management, and place-based planning approach could be used to move commercial marine aquaculture into the EEZ in a timely manner to address the looming U.S. seafood supply gap and make it sustainable (Corbin and Young, 1997).

CONCLUSIONS

**The production, distribution, and use of edible and nonedible fisheries products are increasingly important to the expansive and diverse U.S. economy. Seafood is a multibillion dollar industry that touches a vast majority of the American population and significantly affects their quality of life. The seafood/fisheries economy impacts every state and particularly the numerous communities along the U.S. coasts.** Domestic demand for seafood is projected to increase in the next 10 to 20 years, as indicated by the clear trends for increasing population, per capita consumption, and importation of products.

**Currently, 84% of U.S. seafood consumption is supplied by imports, largely from developing countries in Asia, and this dependency is expected to continue and grow unless there is greater public and especially private investment** (the government does not create businesses and jobs, the private sector does) **into research and development to increase domestic production.** Domestic supplies from commercial fisheries have, more or less, leveled off, and freshwater and marine aquaculture (mostly freshwater species like catfish and trout) have grown steadily but supply only 7% of consumption. Marine aquaculture has the most potential for large-scale expansion but currently supplies only 1.5% of domestic consumption.

Conservatively, projections indicate that the United States will need between 0.29 mmt (641 million pounds) and 0.76 mmt (1.68 billion pounds) more seafood in 2020 and between 0.52 mmt (1.15 billion pounds) and 1.05 mmt (2.32 billion pounds) more in 2030. **The Administration, the Congress, and the American public can choose to continue to rely on imports or deliberately expand marine aquaculture and aquaculture-enhanced fisheries, particularly through establishing commercial farms in the EEZ** and stock enhancement programs to revitalize economically important recreational and commercial marine fisheries.

**Meeting projected American seafood needs largely with imports is considered a “risky proposition” over the long term, with the likelihood that growth projections for global aquaculture will not be met and the near- and long-term high volatility of the international marketplace for seafood products.** Major reasons for this concern include the following:

The rapidly changing demographics in developing countries will affect global seafood distribution and consumption patterns. Increasing population and standards of living in these countries will put pressure on supply distribution channels to the United States and lead to greater regional competition for products in both developed and developing countries.

The strong urbanization trend of the world population is likely to drastically impact how seafood is distributed, as products are directed to urban population centers within regions. A scenario is suggested where regional capture and culture seafood providers will preferentially concentrate on filling nearby urban consumer preferences for high-quality, fresh products.

The dramatic rise of China as a world economic power and a major seafood producer, consumer, exporter, and importer will continue to significantly influence the flow of products in international trade. China’s unpredictable political shifts in domestic and trade policies and its questionable fisheries and aquaculture production capacity create uncertainty that it can feed its growing population and expanding middle class while maintaining its increasingly important role as exporter to the United States.

Developing countries, the predominant source of seafood supply and exports in international trade, are much more vulnerable to the recurring geopolitical events and controversies that will mark the 21st century world’s path to a sustainable future (Friedman, 2008; Brown, 2009). International financial, energy, human rights, homeland security, trade policy, food safety, and other issues can have sudden significant and lasting disruptive impacts on the international seafood trade.

**America has the largest EEZ in the world, with enormous potential for developing sustainable commercial open ocean aquaculture of many economically important species. Likewise, closing the life cycles of important marine species would allow greater use of aquaculture technologies as an important tool to enhance sources of seafood from coastal and ocean capture fisheries through increased stock enhancement.** With greater utilization of the EEZ, multiple use of the resource and other issues will occur and need to be resolved at the site determination stage. **America’s ocean space is enormous, and conservative estimates indicate open ocean aquaculture alone could produce significant amounts of additional seafood** (Nash, 2004).

**The management guru Peter Drucker has suggested, “Aquaculture, not the Internet, represents the most promisng investment opportunity in the 21st Century.”** (Drucker, 1999) Prompted by the recognized opportunities and several comprehensive reports on ocean policy and use, legislation has been proposed in Congress to expand marine aquaculture research and development, particularly in the EEZ. Notably, the Obama Administration has taken a broadened, multiple use approach to ocean planning, policy, and management. Marine aquaculture and fisheries are among the proposed topics for this expanded, multistakeholder discussion of planning and managing a myriad of uses of America’s oceans, particularly the EEZ.

The critical marine aquaculture development issues for stakeholder consensus building include identification of appropriate sites, control of stock escapes, disease prevention and management protocols, reduction in the use of fish meal and oil in stock diets, and development of environmental standards to control potential pollution. It is suggested that a great deal of pertinent scientific information and empirical evidence has been generated in the past 10 years that allows detailed assessment and acceptable predictability for site specific impacts of farming, hence identification of environmentally suitable sites. This database provides an informed basis for establishing an interim ocean permitting and leasing program for the EEZ that can evolve to a standardized process based on establishing and monitoring a finite number of regional commercial demonstration farms. The interim permitting/leasing effort to allow the private sector to spearhead progress should be complemented by increased federal investment in developing commercial-scale marine aquaculture technologies for cultureof species important to farming and aquaculture-enhanced marine fisheries (Browdy and Hargreaves, 2009).

**Greater seafood self-sufficiency and security is required to sustainably and reliably fill America’s growing demand for seafood in a global marketplace.** U.S. imports will become more sensitive to supply disruption due to increasing geopolitical tensions and major demographic and development trends in both the developed and the developing worlds. **Expanding marine aquaculture to sustainably farm the sea and investing in aquaculture-enhanced fisheries management to rebuild and maintain recreational and commercial stocks can significantly increase domestic seafood supplies. It also will provide important job and infrastructure revitalization opportunities for the national economy and many coastal communities.**

The inescapable conclusion to be drawn from this broad review of history, current status, and future of the U.S. seafood “oceanscape” is that **environmentally sustainable, economically viable, and community-accepted expansion of marine aquaculture can and should move forward now.** Industry expansion into the EEZ should not wait for completion of integrated, nationwide marine spatial planning of the ocean environment, a process which could take many years to complete. **There is an urgent need for the Congress and NOAA to take action to increase domestic fish and shellfish supplies through expansion of marine aquaculture to bolster the seafood industry to satisfy its many millions of customers.**

**The impact is global nuclear war**

**Freidberg & Schonfeld, 8** --- \*Professor of Politics and IR at Princeton’s Woodrow Wilson School, AND \*\*senior editor of Commentary and a visiting scholar at the Witherspoon Institute in Princeton (10/21/2008, Aaron and Gabriel, “The Dangers of a Diminished America”, Wall Street Journal, <http://online.wsj.com/article/SB122455074012352571.html?mod=googlenews_wsj>)

**With the global financial system in serious trouble, is America's geostrategic dominance likely to diminish?** If so, what would that mean?

One immediate implication of the crisis that began on Wall Street and spread across the world is that **the primary instruments of U.S. foreign policy will be crimped**. The next president will face an entirely new and adverse fiscal position. Estimates of this year's federal budget deficit already show that it has jumped $237 billion from last year, to $407 billion. With families and businesses hurting, there will be calls for various and expensive domestic relief programs.

In the face of this onrushing river of red ink, both Barack Obama and John McCain have been reluctant to lay out what portions of their programmatic wish list they might defer or delete. Only Joe Biden has suggested a possible reduction -- foreign aid. This would be one of the few popular cuts, but in budgetary terms it is a mere grain of sand. Still, Sen. Biden's comment hints at where **we may be headed: toward a major reduction in America's world role, and perhaps even a new era of financially-induced isolationism.**

**Pressures to cut defense spending, and to dodge the cost of waging two wars, already intense before this crisis, are likely to mount.** Despite the success of the surge, the war in Iraq remains deeply unpopular. Precipitous withdrawal -- attractive to a sizable swath of the electorate before the financial implosion -- might well become even more popular with annual war bills running in the hundreds of billions.

Protectionist sentiments are sure to grow stronger as jobs disappear in the coming slowdown. Even before our current woes, calls to save jobs by restricting imports had begun to gather support among many Democrats and some Republicans. **In a prolonged recession, gale-force winds of protectionism will blow.**

Then **there are the dolorous consequences of a potential collapse of the world's financial architecture. For decades now, Americans have enjoyed the advantages of being at the center of that system. The worldwide use of the dollar, and the stability of our economy**, among other things, **made it easier for us to run huge budget deficits, as we counted on foreigners to pick up the tab by buying dollar-denominated assets as a safe haven.** Will this be possible in the future?

Meanwhile, traditional foreign-policy challenges are multiplying. The threat from al Qaeda and Islamic terrorist affiliates has not been extinguished. Iran and North Korea are continuing on their bellicose paths, while Pakistan and Afghanistan are progressing smartly down the road to chaos. **Russia's new militancy and China's seemingly relentless rise also give cause for concern.**

**If America now tries to pull back from the world stage, it will leave a dangerous power vacuum. The stabilizing effects of our presence in Asia, our continuing commitment to Europe, and our position as defender of last resort for Middle East energy sources and supply lines could all be placed at risk.**

**In** such a scenario there are shades of **the** 19**30s**, **when global trade and finance ground nearly to a halt, the peaceful democracies failed to cooperate, and aggressive powers led by the remorseless fanatics who rose up on the crest of economic disaster exploited their divisions. Today we run the risk that rogue states may choose to become ever more reckless with their nuclear toys, just at our moment of maximum vulnerability.**

**The aftershocks of the financial crisis will almost certainly rock our principal strategic competitors even harder** than they will rock us. The dramatic free fall of the Russian stock market has demonstrated the fragility of a state whose economic performance hinges on high oil prices, now driven down by the global slowdown. China is perhaps even more fragile, its economic growth depending heavily on foreign investment and access to foreign markets. Both will now be constricted, inflicting economic pain and perhaps even sparking unrest in a country where political legitimacy rests on progress in the long march to prosperity.

**None of this is good news if the authoritarian leaders of these countries seek to divert attention from internal travails with external adventures**.

As for our democratic friends, the present crisis comes when many European nations are struggling to deal with decades of anemic growth, sclerotic governance and an impending demographic crisis. Despite its past dynamism, Japan faces similar challenges. India is still in the early stages of its emergence as a world economic and geopolitical power.

What does this all mean? **There is no substitute for America on the world stage**. The choice we have before us is between the potentially disastrous effects of disengagement and the stiff price tag of continued American leadership.

**Boosting domestic ocean aquaculture reverses the seafood trade deficit**

**Strasser, 14** --- Senior Editor of ThinkProgress (4/21/2014, Annie-Rose, “The New, Innovative And More Efficient Way Of Feeding People,” <http://thinkprogress.org/climate/2014/04/21/3422486/big-ag-takes-to-the-ocean/>, JMP)  
**\*\*\*Note --- Don Kent is President of the Hubbs-Sea World Research Institute**

**Models are all that researchers have to go off when assessing the potential impact of increased fish farming**, though. **That’s because the United States is far from a leader in the industry — we’re way behind.** Commercial fishing has remained stagnant while **aquaculture is on the rise worldwide, but here in the U.S. we’re still importing farm-raised fish from other countries** — places including China and Chile — instead of growing it ourselves. **About 91 percent of our seafood originates abroad, and half of it comes from aquaculture.**

Kent says **that system won’t last too long**.

“What’s happening on a global level is that the cost of seafood, because we keep seeing a need for more and more of it — populations are growing, people are eating more and more of it because it’s healthier for them — what’s happening is the economies in the world that are growing right now, like China, Brazil, where economies are starting to grow, their middle class is growing and their ability to buy seafood is increasing,” he explained. “And so **the very countries like China that’s producing the majority of the seafood is keeping it now. So it’s becoming more and more expensive now for us to source the product here.”**

Kent also argues that we should actually want to produce our own seafood here. **From a regulatory standpoint, Americans can have more faith in the quality of fish produced under regulations from our own government.** “We are importing all of this seafood but it’s impossible for us to check it all for all of these chemicals,” he said, “so who knows how it was really grown? But if it’s grown here, unless the farmer is being illegal in his operation, it’d be illegal to do it. ”

**There’s plenty of opportunity for growing more protein from the sea here in the** **U**nited **S**tates. Exclusive Economic Zones, EEZs, are the area of ocean over which a country has exclusive access to natural resources. **The U.S. has the largest EEZ of any country on Earth. But we’re outsourcing our fish production instead of doing it ourselves.** In 2010, the tiny country of Bangladesh — with an EEZ of a little over 78,000 square kilometers — produced 1,308,515 tons of aquaculture. The United States — whose EEZ is nearly twelve times the size — produced 495,499 tons.

“The parts of the world where they have to feed their people or they’re going to starve, like Bangladesh, they get it. They’re doing it,” said Kent. “The people in our country, where we’ll just go buy it somewhere else, are now having to learn the lesson the hard way. Because the sources are drying up. ”

**Independently, the plan creates tens of thousands of jobs**

**Strasser, 14** --- Senior Editor of ThinkProgress (4/21/2014, Annie-Rose, “The New, Innovative And More Efficient Way Of Feeding People,” <http://thinkprogress.org/climate/2014/04/21/3422486/big-ag-takes-to-the-ocean/>, JMP)  
**\*\*\*Note --- Don Kent is President of the Hubbs-Sea World Research Institute**

But where the negative rhetoric around the corporatization of **fish farming** is true, so is the more positive. The industry, for example, **has the potential to bring a significant number of jobs to the** **U**nited **S**tates.

Don Kent says he’s done the calculations based on estimates that **1,000 tons of aquaculture produces about 40 jobs. “California has 37 million people in it,”** he said from his office in San Diego. **“If we grew all the seafood we needed for those people** … **we’d need** something like a quarter million tons of seafood just for California. And figuring, when you filet the fish, you eat half and the other half gets thrown away — the bones and guts and everything — you’d actually need **half a million tons of seafood**. That’s 500,000 tons times 40. **You’re talking about tens of thousands of jobs. Well over 20,000 jobs, just to feed our own people.”**

### Aquaculture Adv: Solvency

#### OTEC makes money and supplies rich nutrients that allows it to produce new resources

IMARES 14(IMARES, an institute that concentrates on research into strategic and applied marine ecology, 6/5, “Delegation in Japan: Ocean Thermal Energy Conversion (OTEC) on the island Kumejima) <https://www.wageningenur.nl/en/newsarticle/Delegation-in-Japan-Ocean-Thermal-Energy-Conversion-OTEC-on-the-island-Kumejima.htm>)

On 13-15 May 2014, a Dutch/Colombian delegation travelled to Kumejima to visit the deep sea water research and industry park at the island. Goal of the mission was to evaluate whether the Kumejima approach could serve as a model for the island of San Andres, Columbia. San Andres considers to develop a similar deep seawater program in collaboration with Dutch company Bluerise and Wageningen UR.¶ Kumejima is a small (46 km2) tropical island in Japan. It is part of the Okinawa prefecture and has 8300 inhabitants. The prefecture of Okinawa wants Kume Island to be 100% sustainable in the year 2020. This was the incentive to install a deep seawater pipeline in 2003.¶ Every day, 13.000 m3 of cold (10°C) seawater is pumped from a depth of 612 m to the island. The water is used for several purposes such as cooling, energy generation, aquaculture and the production of drinking water, salts and cosmetics. The deep water facility includes a research station and a deep water tower, from where the water is further distributed. Around the institute is a 10 ha industrial park. Companies located here are directly connected to the deep water supply. Companies located at a further distance can obtain deep seawater at the “fuel” station for tank wagons.¶ Water generates electricity¶ In addition to direct cooling, the deep water is also used to generate electricity through the process of Ocean Thermal Energy Conversion (OTEC). Kumejima currently has the world’s only operating OTEC installation, a 50 KW demonstration plant. OTEC takes advantage of the difference in temperature between surface water and deep sea water. Warm surface water is used to evaporate a low-boiling point liquid such as ammonia to create steam. The steam drives a turbine that generates electricity. The steam is condensated back to liquid using cold deep seawater.¶ Used seawater further used for aquaculture¶ Deep seawater that has been used for OTEC or cooling can be further used for other purposes such as aquaculture. This 6 ha shrimp farm uses the clean, virus-free deep seawater for its hatchery. The farm produces 250 tonnes of tiger prawn per year and is currently the largest deep water based industry on the island.¶ Deep seawater is rich in inorganic nutrients and as such very suitable for the aquaculture of seaweeds. This farm produces 180 tonnes per year of seagrapes, a local variety of Caulerpa.¶ Deep seawater can also be used for human consumption. In a water factory, deep seawater is converted into drinking water and salt through reversed osmosis.¶ The Dutch delegates conclude the following:¶ Kumejima’s deep water park is an inspiring Small Tropical Island Solution, generating energy, enabling seafood production, creating employment and increasing sustainability.¶ Currently, the deep water-based industries at Kumejima generate an annual turnover of 20 million USD, which is 25% of the islands Gross National Product.¶ Deepwater pipelines at tropical islands should first serve energy generating devices such as OTEC and SWAC. The “waste” water can then be applied for aquaculture and other industries, providing solutions for tropical challenges related to energy, food security and water.¶ Bluerise and Wageningen UR should cooperate in advocating and developing and designing deep water solutions for other tropical islands around the world such as San Andres.

**Benefits to OTEC include chilled soil agriculture, aquaculture, and desalination.**

**US Department of Energy 13 (8/26/13, “Ocean Thermal Energy Conversion Basics”,** <http://energy.gov/eere/energybasics/articles/ocean-thermal-energy-conversion-basics>)

**OTEC has potential benefits beyond power production**. For example, **spent cold seawater from an OTEC plant can chill fresh water in a heat exchanger or flow directly into a cooling system.** Simple systems of this type have air-conditioned buildings at the Natural Energy Laboratory for several years.¶ **OTEC technology** also supports **chilled-soil agriculture. When cold seawater flows through underground pipes, it chills the surrounding soil. The temperature difference between plant roots in the cool soil and plant leaves in the warm air allows many plants that evolved in temperate climates to be grown in the subtropics. The Natural Energy Laboratory maintains a demonstration garden near its OTEC plant with more than 100 fruits and vegetables, many of which would not normally survive in Hawaii.**¶ **Aquaculture is perhaps the most well-known byproduct of OTEC. Cold-water delicacies, such as salmon and lobster, thrive in the nutrient-rich, deep seawater culled from the OTEC process.** Microalgae such as Spirulina, a health food supplement, also can be cultivated in the deep-ocean water.¶ Finally, **an advantage of open or hybrid-cycle OTEC plants is the production of fresh water from seawater. Theoretically, an OTEC plant that generates 2 megawatts of net electricity could produce about 14,118.3 cubic feet (4,300 cubic meters) of desalinated water each day.**

## Adv: Desalination

### Desal Adv: 1AC

#### Water scarcity conflicts are on the brink now—signs of transboundary risks are growing, specifically in the Middle East and Africa

Wong 6/23 (6/23/14, Sterling Wong, a writer for Bloomberg, “Water Scarcity May Spark Geopolitical Conflicts: Council”, <http://www.bloomberg.com/news/2014-06-23/water-scarcity-may-spark-geopolitical-conflicts-council.html>)

**Water scarcity may spark geopolitical conflicts in such countries as those around the Tigris-Euphrates and Nile river basins**, according to the World Water Council’s president. ¶ “**Water and politics**, they **go hand-in-hand**,” Benedito Braga said in a June 20 interview after the conclusion of the [Singapore International Water Week](http://www.siww.com.sg/media/collaborations-reinforce-singapore-international-water-week-premier-global-platform-share-and). “With rivers that are shared by two or more countries, the severity of climate and the stress in water may lead to political instability.” ¶ **There are already signs of transboundary water risks.** [**Egypt**](http://topics.bloomberg.com/egypt/) **opposes Africa’s largest power plant being built by** [**Ethiopia**](http://topics.bloomberg.com/ethiopia/)**, saying it will reduce the flow of the Nile needed by farmers, while the conflict in** [**Syria**](http://topics.bloomberg.com/syria/) **has been exacerbated by groundwater depletion, drought and poor water management.** ¶ [Turkey](http://topics.bloomberg.com/turkey/) received little snowfall at the start of the year, meaning it will likely use more water stored in reservoirs to irrigate crops. That may affect supplies downstream along the Tigris-Euphrates, where water quality and pollution are also issues, Braga said. The Tigris-Euphrates river basin is shared by Turkey, Iraq, Syria and Iran. ¶ **The water-stressed region around the Nile, which flows through 10 countries including Sudan, Ethiopia and Egypt, is another area of possible conflict**, Braga said. ¶ “These are examples of situations in which water resource management and water diplomacy will have to be exercised with care in order to minimize risk of other types of conflicts,” Braga said by phone from [Singapore](http://topics.bloomberg.com/singapore/).

#### Water scarcity causes Middle East war

Nitish Priyadarshi 12, lecturer in the department of environment and water management at Ranchi University in India, “War for water is not a far cry”, June 16, <http://www.cleangangaportal.org/node/44>

The crisis over water in the Middle East is escalating. Despite existing agreements, dwindling resources – increasingly affected by pollution, agricultural/industrial initiatives and population growth – have elevated the strategic importance of water in the region. **For Middle Eastern nations, manyalready treading the razor’s edge of conflict, wateris becoming a catalyst for confrontation** – an issue of national security and foreign policy as well as domestic stability. Given water’s growing ability to redefine interstate relations, the success of future efforts to address water sharing and distribution will hinge upon political and strategic approaches to this diminishing natural resource.**In the Middle East, water resources are plummeting**. While representing 5% of the total world population, the Middle East & North Africa (MENA) region contains only 0.9% of global water resources.1 The number of water-scarce countries in the Middle East and North Africa has risen from 3 in 1955 (Bahrain, Jordan and Kuwait) to 11 by 1990 (with the inclusion of Algeria, Israel and the Occupied Territories, Qatar, Saudi Arabia, Somalia, Tunisia, the United Arab Emirates and Yemen). Another 7 are anticipated to join the list by 2025 (Egypt, Ethiopia, Iran, Libya, Morocco, Oman and Syria).In addition to its scarcity, much of Middle Eastern water stems from three major waterways: the Tigris-Euphrates, Nile and Jordan River systems. Mutual reliance on these resources has made water a catalyst for conflict, spurring confrontations such as the 1967 War (fomented by Syria’s attempts to divert water from Israel) and the Iran-Iraq War (which erupted from disputes over water claims and availability). Recognition of water’s role as an obstacle in interstate relations has spurred numerous attempts at resolution, including diplomatic efforts (most notably the 1953-1955 U.S.-brokered Johnston negotiations) and bilateral and multilateral treaty efforts, ranging from the 1959 Agreement for the Full Utilization of Nile Waters to the 1994 Israeli-Jordanian Treaty.Along the Tigris and Euphrates Rivers, Turkey and Syria are currently approaching a massive confrontation over water resources. Relations between the two countries, strained at best, have been exacerbated since the 1980s by growing tensions over water, which have brought them to the brink of war several times.The Jordan River Basin has also emerged as a flashpoint for conflict over water. Resources in the area, suffering serious overuse as a result of pollution and population growth, have increasingly impacted interstate relations.Between Jordan and Israel, water resource issues are reaching a fever pitch. Despite the 1994 Israeli-Jordanian Treaty – which established comprehensive guidelines regulating the distribution, preservation and availability of water from the Jordan and Yarmouk Rivers – conflicts over water have risen to the forefront of relations between the two countries. Jordan, fed only by underground sources and the Jordan River, has experienced an escalating water deficit – one that is expected to reach 250 million cubic meters (nearly 1/3rd of current annual consumption) by 2010. At the same time, Israel – currently utilizing almost all available water from its National Water System (consisting of the West Bank Mountain Aquifer, the Coastal Aquifer and the Lake Kinneret Basin) – has been forced to resort to overexploitation of available resources for expanding agricultural and industrial ventures. As a result, water has become a critical bone of contention between the two countries.The historically troubled relations between Israel and the Palestinians have also been magnified by water. Mutual reliance on the West Bank Mountain Aquifer, which rests atop the demarcating border of the disputed West Bank territory (and currently provides 1/3rd of Israel’s water supply and 80% of Palestinian consumption), has created friction between the State of Israel and the Palestinian Authority.

**Middle East war goes nuclear**

James A. **Russell,** Senior Lecturer, National Security Affairs, Naval Postgraduate School, ‘9 (Spring) “Strategic Stability Reconsidered: Prospects for Escalation and Nuclear War in the Middle East” IFRI, Proliferation Papers, #26, http://www.ifri.org/downloads/PP26\_Russell\_2009.pdf

**Strategic stability in the region is** thus **undermined by** various factors: (1) asymmetric interests in the bargaining framework that can introduce unpredictable behavior from actors; (2) **the presence of non-state actors that introduce unpredictability into relationships between the antagonists**; (3) **incompatible assumptions about** the structure of **the deterrent relationship that makes** the **bargaining** framework strategically **unstable;** (4) **perceptions by Israel and the United States that its window of opportunity** for military **action is closing, which could prompt a preventive attack**; (5) the prospect that Iran’s response to pre-emptive attacks could involve unconventional weapons, which could prompt escalation by Israel and/or the United States; (6) **the lack of a communications framework to build trust and cooperation among framework participants**. These systemic weaknesses in the coercive bargaining framework all suggest that escalation by any the parties could happen either on purpose or as a result of miscalculation or the pressures of wartime circumstance. Given these factors**, it is disturbingly easy to imagine scenarios under which a conflict could quickly escalate in which the regional antagonists would consider the use ofchemical, biological, or nuclear weapons**. **It would be a mistake to believe the nuclear taboo can somehow magically keep nuclear weapons from being usedin the context of an unstable strategic framework.Systemic asymmetries** between actors in fact s**uggest** a certain increase in **the probability of war** – a war in which escalation could happen quickly and from a variety of participants. **Once such a war starts, events would likely develop a momentum all their own** and decision-making would consequently be shaped in unpredictable ways. The international community must take this possibility seriously, and muster every tool at its disposal to prevent **such an outcom**e, which **would be an unprecedented disaster for the** peoples of the **region, with substantial risk for the entire world**.

#### African war goes global

Glick 7

Caroline Glick 7, deputy managing editor of The Jerusalem Post, Senior Fellow for Middle East Affairs of the Center for Security Policy, “Condi's African holiday”, December 11, http://www.rightsidenews.com/20071211309/editorial/us-opinion-and-editorial/our-world-condis-african-holiday.html

The Horn of Africa is a dangerous and strategicallyvital place. Small wars, which rage continuously, can easily escalate into big wars. Local conflicts have regional and global aspects. All of the conflicts in this tinderbox, which controls shipping lanes from the Indian Ocean into the Red Sea, can potentially give rise to regional, and indeed global conflagrations between competing regional actors and global powers.

#### African war makes global disease pandemics inevitable, killing millions.

**VOA** (Voice of America), 8-31-**2005**, a multimedia international broadcasting service funded by the U.S. Government through the Broadcasting Board of Governors, “Poverty and Conflict Contribute the Spread of Infectious Diseases,” <http://www.voanews.com/english/archive/2005-08/2005-08-31-voa23.cfm>

Communicable diseases such as flu, AIDS and SARS can become worldwide epidemics, killing millions. Containing such diseases is often seen as a medical problem, to be solved in a laboratory. But, human factors such as war poverty and politics can be just as important in determining how far and fast a *disease* will spread. When public health officials wrestle with halting the spread of communicable diseases, they must also wrestle at the same time with poverty. That's because more than half the people on Earth live in poverty, existing on less than $2 (US) per day. Also, poverty and disease are linked in a vicious cycle, says Stewart Parkinson, of Population Services International, which works to improve health in developing countries. “A person with very little money can't necessarily choose where they live. They might have to live in a slum with open sewers. So they're much more susceptible to infection. Often because they get repeated infections, their immune systems just get destroyed so they are much more susceptible to further infections. It's a condition where everything mounts together to create a perfect storm, and being poor means you cannot weather that storm.” In poor areas, health care efforts often fail, said Dr. Joxel Garcia, deputy director of the Pan American Health Organization due to lack of resources, “If you don't have primary care, if you don't have nurses in public health, if you don't have doctors, if you don't have the infrastructure to create systems related to health, then you cannot sustain the approach.” Dr. Garcia says war also spreads disease because it often creates large populations of refugees. “And they're moving from one town to another, or one country to another (and) they may bring with them some prevalence of disease that may not be a disease that is present in that other country.” Mr. Parkinson adds, “It's also probably no coincidence that the great Spanish flu epidemic of 1918 was associated with troop movements in Europe and especially afflicted the United States because that was the time of the U.S. involvement in the war, and the troop movements back and forth created a great vector for infection.” The epidemic itself killed more people than died in the entire war -- an estimated 20 to 40 million people died from the epidemic. Where there are soldiers and conflict, there are also prostitutes and rape. This has led to a rapid spread of AIDS in many war-torn African countries, say public health officials. Conflict impacts disease in other ways, too, said Dr. Joseph Malone, director of the U.S. Navy's program to track emerging global infections. “Basic services such as clean water, *availability of food, are threatened when there's substantial* conflict and generally the health care infrastructure and availability of medicines is generally reduced whenever there's conflict and even any supplies that might be available can be diverted to non-helpful uses.”

#### New-type infectious disease spread causes extinction.

Victoria **Yu**, 5-22-**2009**, Dartmouth Journal of Science, “Human Extinction: The Uncertainty of Our Fate,” http://dujs.dartmouth.edu/spring-2009/human-extinction-the-uncertainty-of-our-fate

A pandemic will kill off all humans. In the past, humans have indeed fallen victim to viruses. Perhaps the best-known case was the bubonic plague that killed up to one third of the European population in the mid-14th century (7). While vaccines have been developed for the plague and some other infectious diseases, new viral strains are constantly emerging — a process that maintains the possibility of a pandemic-facilitated human extinction. Some surveyed students mentioned AIDS as a potential pandemic-causing virus. It is true that scientists have been unable thus far to find a sustainable cure for AIDS, mainly due to HIV’s rapid and constant evolution. Specifically, two factors account for the virus’s abnormally high mutation rate: 1. HIV’s use of reverse transcriptase, which does not have a proof-reading mechanism, and 2. the lack of an error-correction mechanism in HIV DNA polymerase (8). Luckily, though, there are certain characteristics of HIV that make it a poor candidate for a large-scale global infection: HIV can lie dormant in the human body for years without manifesting itself, and AIDS itself does not kill directly, but rather through the weakening of the immune system. However, for more easily transmitted viruses such as influenza, the evolution of new strains could prove far more consequential. The simultaneous occurrence of antigenic drift (point mutations that lead to new strains) and antigenic shift (the inter-species transfer of disease) in the influenza virus could produce a new version of influenza for which scientists may not immediately find a cure. Since influenza can spread quickly, this lag time could potentially lead to a “global influenza pandemic,” according to the Centers for Disease Control and Prevention (9). The most recent scare of this variety came in 1918 when bird flu managed to kill over 50 million people around the world in what is sometimes referred to as the Spanish flu pandemic. Perhaps even more frightening is the fact that only 25 mutations were required to convert the original viral strain — which could only infect birds — into a human-viable strain (10).

**Water scarcity affects 1/5 of the human population and the number is continuing to grow**

**United Nations 2006**

<http://www.un.org/waterforlifedecade/scarcity.shtml>

**Water scarcity** already **affects every continent**. Around **1.2 billion people, or almost one-fifth of the world's population, live in areas of physical scarcity, and 500 million people are approaching this situation**. Another 1.6 billion people, or almost one quarter of the world's population, face economic water shortage (where countries lack the necessary infrastructure to take water from rivers and aquifers). Water scarcity is among the main problems to be faced by many societies and the World in the XXIst century. **Water use has been growing at more than twice the rate of population increase in the last century**, and, although there is no global water scarcity as such, an increasing number of regions are chronically short of water. Water scarcity is both a natural and a human-made phenomenon. There is enough freshwater on the planet for seven billion people but it is distributed unevenly and too much of it is wasted, polluted and unsustainably managed. Sources: Human Development Report 2006. UNDP, 2006 Coping with water scarcity. Challenge of the twenty-first century. UN-Water, FAO, 2007 Water scarcity and the MDGs The way water scarcity issues are addressed impacts upon the successful achievement of most of the Millennium Development Goals: MDG 1: Access to water for domestic and productive uses (agriculture, industry, and other economic activities) has a direct impact on poverty and food security. MDG 2: Incidence of catastrophic but often recurrent events, such as droughts, interrupts educational attainment. MDG 3: Access to water, in particular in conditions of scarce resources, has important gender related implications, which affects the social and economic capital of women in terms of leadership, earnings and networking opportunities. MDGs 4 and 5: Equitable, reliable water resources management programmes reduce poor people's vulnerability to shocks, which in turn gives them more secure and fruitful livelihoods to draw upon in caring for their children. MDG 6: Access to water, and improved water and wastewater management in human settlements, reduce transmission risks of mosquito-borne illnesses, such as malaria and dengue fever. MDG 7: Adequate treatment of wastewater contributes to less pressure on freshwater resources, helping to protect human and environmental health. MDG 8: Water scarcity increasingly calls for strengthened international cooperation in the fields of technologies for enhanced water productivity, financing opportunities, and an improved environment to share the benefits of scarce water management. Water stress versus water scarcity Hydrologists typically assess scarcity by looking at the population-water equation. An area is experiencing water stress when annual water supplies drop below 1,700 m3 per person. When annual water supplies drop below 1,000 m3 per person, the population faces water scarcity, and below 500 cubic metres "absolute scarcity". Source: [World Water Development Report 4](http://www.zaragoza.es/ciudad/medioambiente/onu/en/detallePer_Onu?id=71). World Water Assessment Programme (WWAP), March 2012. **Water scarcity is defined as the point at which the aggregate impact of all users impinges on the supply or quality of water under prevailing institutional arrangements to the extent that the demand by all sectors, including the environment, cannot be satisfied fully.** Water scarcity is a relative concept and can occur at any level of supply or demand. Scarcity may be a social construct (a product of affluence, expectations and customary behaviour) or the consequence of altered supply patterns - stemming from climate change for example. Did you know? Around 700 million people in 43 countries suffer today from water scarcity. **By 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the world's population could be living under water stressed conditions**. **With the existing climate change scenario, almost half the world's population will be living in areas of high water stress by 2030, including between 75 million and 250 million people in Africa**. In addition, water scarcity in some arid and semi-arid places will displace between 24 million and 700 million people. **Sub-Saharan Africa has the largest number of water-stressed countries of any region.**

**Access to clean water is a human right, and it’s key to realization of all human rights**

**United Nations 2012**

<http://www.un.org/waterforlifedecade/human_right_to_water.shtml>

On 28 July 2010, through [Resolution 64/292](http://www.un.org/es/comun/docs/?symbol=A/RES/64/292&lang=E), **the U**nited **N**ations General Assembly explicitly **recognized the human right to water** and sanitation **and acknowledged that clean drinking water and sanitation are essential to the realisation of all human rights.** **The Resolution calls upon States** and international organisations **to provide financial resources, help capacity-building and technology transfer to help countries, in particular developing countries, to provide safe, clean, accessible and affordable drinking water and sanitation for all**. In November 2002, the Committee on Economic, Social and Cultural Rights adopted [General Comment No. 15](http://www.unhchr.ch/tbs/doc.nsf/0/a5458d1d1bbd713fc1256cc400389e94/$FILE/G0340229.pdf) on the right to water. Article I.1 states that "**The human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights"**. Comment No. 15 also defined **the right to water as the right of everyone to sufficient, safe, acceptable and physically accessible and affordable water for personal and domestic uses.**

**Human rights violations cause dehumanization**

**Maiese 03**

Michelle Maiese, graduate student of Philosophy @ the University of Colorado, Boulder and is a part of the research staff at the Conflict Research Consortium, July 2003 <http://www.beyondintractability.org/essay/dehumanization>

**Dehumanization is a psychological process whereby opponents view each other as less than human and thus not deserving of moral consideration**. Jews in the eyes of Nazis and Tutsis in the eyes of Hutus (in the Rwandan genocide) are but two examples. Protracted conflict strains relationships and makes it difficult for parties to recognize that they are part of a shared human community. Such conditions often lead to feelings of intense hatred and alienation among conflicting parties. The more severe the conflict, the more the psychological distance between groups will widen. Eventually, this can result in [moral exclusion](http://www.beyondintractability.org/essay/intolerable-moral-differences). Those excluded are typically viewed as inferior, evil, or criminal.[1] We typically think that **all people have some basic human rights that should not be violated**. Innocent people should not be murdered, raped, or tortured. Rather, [international law](http://www.beyondintractability.org/essay/international-law) suggests that **they should be treated**[**justly and fairly**](http://www.beyondintractability.org/essay/principles-of-justice)**, with dignity and respect**. They deserve to have their basic needs met, and to have some freedom to make autonomous decisions. In times of war, parties must take care to protect the lives of innocent civilians on the opposing side. Even those guilty of breaking the law should receive a fair trial, and should not be subject to any sort of cruel or unusual punishment. However, for individuals viewed as outside the scope of morality and justice, "the concepts of deserving basic needs and fair treatment do not apply and can seem irrelevant."[2] Any harm that befalls such individuals seems warranted, and perhaps even morally justified. Those excluded from the scope of morality are typically perceived as psychologically distant, expendable, and deserving of treatment that would not be acceptable for those included in one's moral community. Common criteria for exclusion include ideology, skin color, and cognitive capacity. We typically dehumanize those whom we perceive as a threat to our well-being or values.[3] Psychologically, it is necessary to categorize one's enemy as sub-human in order to legitimize increased violence or justify the violation of basic human rights. [Moral exclusion](http://www.beyondintractability.org/essay/intolerable-moral-differences) reduces restraints against harming or exploiting certain groups of people. In severe cases, **dehumanization makes the violation of generally accepted norms of behavior regarding one's fellow man seem reasonable,** or even necessary.

**OTEC can produce massive amounts of fresh drinking water, reducing the risk of global conflict**

**Websdale** Communications Support Officer at The Wildlife Trusts **6/17/**14 (Emma Websdale, “5 Reasons Why Hundreds of People Think OTEC Is a Smart Investment,” Empower the Ocean, http://empowertheocean.com/otec-investment/) LR

5) **OTEC Enhances International Security and Reduces the Risk of Conflict. Investments** of over US$260m (£168m) **into research and development funds (R&D) for Ocean Thermal Energy Conversion (OTEC) have made harvesting this renewable energy achievable at the present time. OTEC’s ability to simultaneously produce voluminous quantities of fresh drinking water and baseload renewable energy will be a factor in reducing global water-stress conflict and safeguarding international security.** The OTEC demonstration plant, built in Hawaii in the 1990s, bears witness to OTEC’s reliability against tropical storms and hurricanes. With twenty uninterrupted years of cold deep ocean water flowing through its pipes, the facility proves that climate-**driven weather events pose minimal threat to OTEC**’s functional components. **This makes OTEC technology one of the most stable foundations on which to build a future of clean global energy.** Global commercialization of SWAC systems and **OTEC plants will provide hundreds of communities with the self-empowerment tools they need to shape a sustainable future. As countries develop clean energy, they can step away from volatile and expensive fossil fuels** and move closer to long-term energy independence.In summary, by providing safe, reliable products that are in great demand by the world’s core markets, OTEC offers enormous business investment opportunities. Its technologies also offer a vision of community independence, carbon emission reduction and fresh drinking water supplies around the globe.

**OTEC is the best method to desalinate water—prevents pollution problems associated with other forms of desalination and is more cost-effective**

Oney 13

Steven Oney November 20th 2013 <http://empowertheocean.com/ocean-thermal-energy-water-production/> Dr. Oney is Chief Science Advisor for Ocean Thermal Energy Corporation and has over 25 years of extensive experience in ocean engineering. He is well published on the subjects of Ocean Thermal Energy Conversion (OTEC) and Sea Water District Cooling (SDC), and has been called upon frequently to deliver lectures on these technologies. Dr. Oney has hands-on experience with both OTEC and SDC design and was integral in the research leading to the design and development of the first Net Power Producing Experimental (NPPE) land-based OTEC plant in Hawaii.

Ocean thermal energy conversion (OTEC**)** is unique in that it naturally combines opportunities for power production with seawater desalination**.** Using the temperature differential **between warm ocean surface water and cold deep water** to generate clean **baseload (24/7)** renewable energy**, in a closed cycle OTEC system,** the heat from the surface water is used to boil a working fluid **with a low boiling point (such as ammonia),** creating steam which turns a turbine generator to produce electricity. The chill from the cold deep water is then used to condense the steam back into liquid form, allowing the system to continuously repeat this process, perpetually fuelled by the sun’s reliable daily heating of the surface water**.** Because massive amounts of seawater are pumped through an OTEC system **in order to generate this baseload (24/7) power,** the **proximity of the voluminous energy and water supplies allow OTEC to function efficiently and economically with typical thermal desalination processes,** as well as those driven solely by electricity. **The environmental impact of desalinating seawater is quite high when using fossil fuels. Replacing the energy supply with a renewable energy source, such as OTEC, eliminates the pollution caused by fossil fuels and other problems associated with the use of fossil fuels to produce potable water**. Greater self-sufficiency is also achieved through the use of a readily available source of energy like OTEC, making it unnecessary to rely on increasingly expensive fossil fuels imported from often unstable or unfriendly countries. In the last two decades, rising fossil fuel prices and technical advances in the offshore oil industry, many of which are applicable to deep cold water pipe technology for OTEC, mean that small (5-20MW) land-based OTEC plants can now be built with off-the-shelf components, with minimal technology/engineering risks for plant construction and operation. In fact, the authoritative US Government agency NOAA issued a 2009 report concluding that, using a single cold water pipe (CWP), a 10MW OTEC plant is now “technically feasible using current design, manufacturing, deployment techniques and materials.” These two historic changes have now made OTEC electricity pricing increasingly competitive, particularly in tropical island countries where electricity prices, based almost entirely on imported fossil fuels, are currently in the exorbitant range of 30-60 cents/kwh. **Adding potable water production to the equation only further improves the economic attractiveness of this technology’s unique symbiosis between clean reliable energy and fresh water.** With the growing global need for potable water, the lack of available fresh water sources, increasing concentration of populations in coastal regions, and rising energy prices, pairing potable water production with baseload (24/7) **renewable energy from the sea is a natural fit.**

### Desal Adv: Solvency

#### OTEC can provide power for desalination

**Magesh 10** (R. Magesh, 6/2/10, OTEC Technology- A World of Clean Energy and Water, Proceedings of the World Congress on Engineering 2010 Vol II WCE 2010, R. Magesh is with Coastal Energen Pvt. Ltd., http://wenku.baidu.com/view/042c2a1da300a6c30c229f40.html)

Scientists all over the world are making predictions about the ill effects of Global warming and its consequences on the mankind. Conventional Fuel Fired Electric Power Stations contribute nearly 21.3% of the Global Green House Gas emission annually. Hence, an alternative for such Power Stations is a must to prevent global warming. One fine alternative that comes to the rescue is the Ocean thermal energy conversion (**OTEC**) Power Plant , the complete Renewable Energy Power Station for obtaining Cleaner and Greener Power. Even though the concept is simple and old, recently it **has gained** momentum due to worldwide search **for clean continuous energy sources to replace the fossil fuels**. The design of a 5 Megawatt OTEC Pre-commercial plant is clearly portrayed to brief the OTEC technical feasibility along with economic consideration studies for installing OTEC across the world. **OTEC plant can be seen as a combined Power Plant and Desalination plant**. Practically, for every Megawatt of power generated by hybrid OTEC plant, nearly 2.28 million litres of desalinated water is obtained every day. Its value is thus increased because many parts of the globe are facing absolute water scarcity. **OTEC could produce enough drinking water to ease the crisis drought-stricken areas. The water can be used for local agriculture and industry**, any excess water being given or sold to neighboring communities.

#### OTEC improves the process of electricity and production of desalinated water.

**Cross 12** (Martin, 3rd Jan 2012, Martin Cross is a technical translator and writer, a former chef and marketer. He write articles on food, travel, politics, religion and technology among other topics.<http://guides.wikinut.com/Desalination-and-other-by-products-from-OTEC-power-plants/3d2c_avm/#OTEC-freshwater-production-desalination>)

**An OTEC plant** operating in open-cycle or hybrid configuration **produces fresh water through evaporation and condensation, at no additional cost**, as an integral part of the power generation process. It is estimated that **a 2MW OTEC power plant could produce 4300 cubic metres** (150,000 cu. ft) **of desalinated water per day.** In addition to consumption as drinking water, **this desalinated water can also be used for many other purposes.** The amount of energy from the Sun falling on the Earth’s surface in a single day is sufficient to provide all of Earth’s current power requirements for more than a year. A significant proportion of this energy warms the Tropical oceans creating an enormous, constantly renewed, potential energy source. **OTEC plants** are capable of exploiting this energy source economically and **can reduce the costs of the energy consumed in the electricity generation process** through the use of solar panels to power the pumps, etc. When coupled with the potential revenue streams from the plant’s by-products and ancillary services the plant’s operating costs are reduced still further. **OTEC plants also provide considerable benefits to water-starved island communities through** ancillary **freshwater production and** the potential for **increased food production**. These ancillary products also provide the potential for [self-sufficient deepwater plants](http://guides.wikinut.com/Floating-OTEC-power-plants%3A-artificial-island-communities/_2_snimo/), greatly extending the extent to which thermal energy from the oceans can be utilized. Research is also continuing into exploiting ocean temperature differences outside the tropical zone. If just a fraction of the resources and ingenuity expended on developing ways to extract more inaccessible fossil fuels were utilized in developing exploitation of the constantly renewed, clean, essentially free and almost inexhaustible energy available from the planet’s oceans, no doubt output efficiencies and operating costs from these nascent technologies could be significantly improved.

#### OTEC desalination can produce up to 4300 cubic meters of water per day.

Cross 12 (Martin, 1/3/12, “Desalination and other products from OTEC power plants”, <http://guides.wikinut.com/Desalination-and-other-by-products-from-OTEC-power-plants/3d2c_avm/>

**An OTEC plant** operating in open-cycle or hybrid configuration p**roduces fresh water through evaporation and condensation, at no additional cost,** as an integral part of the power generation process. I**t is estimated that a 2MW OTEC power plant could produce 4300 cubic metres (150,000 cu. ft) of desalinated water per day.** In addition to consumption as drinking water, this desalinated water can also be used for many other purposes.

**OTEC is comparatively better than other energy technology and additionally desalinates water.**

**Holt, no date** (Chris Holt, a retired professor at the Institute of Physics, “Energy from the Oceans”, <https://www.iop.org/activity/groups/subject/env/prize/file_40766.pdf>)

**OTEC has many advantages over other sources of energy. OTEC does not produce ¶ carbon dioxide or radioactive waste. The am¶ ount of energy available is vast, none of ¶ the other alternatives to fossil fuel can even come close to the magnitude of the OTEC ¶ resource**. And, unlike wind or wave power, OTEC offers energy in constant supply, ¶ available day and night regardless of the weather and with only a small seasonal ¶ variation. ¶ **Unlike other clean energy technologies, OTEC has some useful by-products. OTEC ¶ plants can be used to produce fresh water from seawater. In the open-cycle system, ¶ warm water is vaporised when it is subjected to a low pressure. The salt is left behind ¶ and the condensed steam is almost pure water. The desalination produced by OTEC in ¶ this way is effectively free.**

**OTEC can provide fresh water through pipes**

**OTE, no date** (Ocean Thermal Energy Corporation, “Technologies”, <http://www.otecorporation.com/technologies.html>)

To generate clean renewable energy, without the use of fossil fuels, Ocean Thermal Energy Corporation (OTE) employs the proven technology, Ocean Thermal Energy Conversion (**OTEC**). This technology **works by using the natural temperature differential between warm surface water in the world’s tropical regions and cold deep ocean water.** Such differential provides the source for sustainable baseload (24/7) electricity production, which is in ever-increasing demand across the globe today. **In addition to clean energy production, OTE will make full use of the large quantities of ocean water drawn at its OTEC plants, by desalination to produce fresh drinking water, which is also in expanding global demand today**. **OTE further brings to market the technology of Seawater Air Conditioning (SWAC), which employs a large cold water pipe to provide chilled deep seawater as the non-polluting refrigerant for air-conditioning buildings.** Compared to conventional AC methods, some SWAC systems save an estimated 80-90 percent in air-conditioning electricity usage, thereby greatly curtailing carbon emissions.

**OTEC desalinates water – key to provide fresh water to coastal commnities**

**Finney 8** (Karen Anne, “Ocean Thermal Energy Conversion,” <http://www.soe.uoguelph.ca/webfiles/gej/articles/GEJ_001-017-023_Finney_Ocean_Thermal_Energy.pdf>)

**Desalination is just one of the effective potential products that could be produced via OTEC¶ technology. Fresh water can be produced in open-cycle OTEC plants when the warm water is vaporized to¶ turn the low pressure turbine.** **Once the electricity is produced the water vapor is condensed to make fresh¶ wate**r (Takahashi and Trenka, 1996). This water has been found to be purer then water offered by most¶ communities as well it is estimated that **1 MW plant could produce 55 kg of water per second. This rate of¶ fresh water could supply a small coastal community with approximately 4000 m¶ 3¶ /day of fresh water¶** (Takahashi and Trenka, 1996). **This water can also be used for irrigation to improve the quality and¶ quantity of food on coastal regions especia¶ lly where access to fresh water is scarce.**

### Desal Adv: Timeframe Ext.

**Water scarcity will happen by 2030 – most definite timeframe**

RT 13 (10/9/13, “Water Scarcity by 2030: True for Every Second Person on Earth, UN says”, <http://www.globalresearch.ca/water-scarcity-by-2030-true-for-every-second-person-on-earth-un-says/5353613>)

About a half of the global population could be facing water shortages by 2030 when demand would exceed water supply by 40 percent, says United Nations Secretary General Ban Ki-Moon.¶ Opening the Water Summit in Budapest, Hungary on Tuesday, the UN chief warned against unsustainable use of water resources.¶ “Water is wasted and poorly used by all sectors in all countries. That means all sectors in all countries must cooperate for sustainable solutions. We must use what we have more equitably and wisely,” Ban said, as cited by the UN website.¶ “By 2030 nearly half the global population could be facing water scarcity. Demand could outstrip supply by 40 per cent.”¶ Governments cannot cope with the problem on their own, without the “full engagement” of all other players, including business, Ban underlined.

### Desal Adv: A2 “No Water Wars”

**Water wars are the most likely to cause conflict**

Coddrington 7/1/10

<http://www.tomorrowtoday.co.za/2010/07/01/a-looming-crisis-world-water-wars/>

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People go to war when their way of life is threatened. I have written before about the many issues we face in the coming years that threaten our way of life. These include global warming/climate change, pollution, pandemics, nuclear bombs, intelligent machines, genetics, and more. More and more I am becoming convinced that **the next major regional/global conflict will be over water. We are much more likely** to have **water wars in the next decade than nuclear ones**. And I were to guess, I’d say that it is **most likely** to happen in around North East Africa. This is a region with its own internal issues. But **it also has the foreign involvement of America, China, the Middle Eastern Arab nations, and**(increasingly) **Israel**. Quite **a potent mix**… Last week, Addis Ababa, Ethiopia hosted the 18th regular meeting of the Council of Ministers of Water Affairs of the Nile Basin countries. In the lead up to the conference, Ethiopia, Rwanda, Uganda, Tanzania and Kenya, the five countries that are all upstream of Egypt and Sudan concluded a water-sharing treaty – to the exclusion of Egypt and Sudan. This has obviously reignited the longstanding dispute over water distribution of the world’s longest river in the world’s driest continent. Egypt is currently the largest consumer of Nile water and is the main beneficiary of a 1929 treaty which allows it to take 55.5 billion cubic metres of water each year, or 87% of the White and Blue Nile’s flow. By contrast, Sudan is only allowed to draw 18.5 billion cubic metres. On attaining independence Sudan refused to acknowledge the validity of the Nile water treaty and negotiated a new bilateral treaty with Egypt in 1959. Kenya, Tanzania and Uganda also expressly refused to be bound by the treaty when they attained independence, but have not negotiated a new treaty since then. Under the 1929 treaty, Egypt has powers over upstream projects: The Nile Waters Agreement of 1929 states that no country in the Nile basin should undertake any works on the Nile, or its tributaries, without Egypt’s express permission. This gives Egypt a veto over anything, including the building of dams on numerous rivers in Kenya, Burundi, Rwanda, Tanzania, Ethiopia, and by implication Egypt has control over agriculture, industry and infrastructure and basic services such as drinking water and electricity in these countries. This is surely untenable. But if the other countries broke the treaty, would Egypt respond with force? Since the late 1990s, Nile Basin states have been trying unsuccessfully to develop a revised framework agreement for water sharing, dubbed the Nile Basin Initiative (NBI). In May 2009, talks held in Kinshasa broke down because Egypt and Sudan’s historical water quotas were not mentioned in the text of the proposed agreement. Water ministers met again in July 2009 in Alexandria, where Egypt and Sudan reiterated their rejection of any agreement that did not clearly establish their historical share of water. This is an untenable position. Upstream states accuse Egypt and Sudan of attempting to maintain an unfair, colonial-era monopoly on the river. Egyptian officials and analysts, however, defend their position, pointing out that Egypt is much more dependent on the river for its water needs than its upstream neighbours. Egypt claims that Nile water accounts for more than 95% of Egypt’s total water consumption, although they appear to be working hard to reduce both their water usage (they’re stopping growing rice, for example) and their dependence on the Nile.

## Adv: Hydrogen

### Hydrogen Adv: 1AC

#### OTEC has the ability to produce hydrogen and jumpstart the hydrogen economy

OTEC 14 (Ocean Thermal Energy Cooperation 2014, “Future Initiatives” http://www.otecorporation.com/future\_strategic\_initiatives.html)

Hydrogen Production **Hydrogen is among the greatest of possible sources to meet the world’s rapidly expanding energy demands**. The capacity of this abundant natural resource to potentially transform and sustain the international transportation industry is truly staggering. Proven methods of electrolysis generally entail passing an electric current through water (H2O) to split the molecule into its component parts of oxygen (O2) and hydrogen gas (H2). **As water itself comprises one of the most plentiful natural resources on our planet, tapping into this enormous reserve is an area justifying diligent research**. Ocean Thermal Energy Corporation is proud to be part of such research in its committed efforts to solve global energy challenges. **The proven scientific process of** Ocean Thermal Energy Conversion (**OTEC**), involving large quantities of deep ocean water, **is a perfect match for integrated research into** **the** potential **hydrogen economy**. With hydrogen as one of the most attractive and versatile transportable forms of energy, **the huge reservoir of this resource in the world’s tropical oceans signifies the potential of OTEC facilities to include hydrogen production**. At Ocean Thermal Energy Corporation, we not only imagine a day where a global fleet of energy-harvesting OTEC plantships grazing the earth’s tropical oceans could supply the majority of the world’s energy needs via hydrogen, we are working to make that vision a reality.

#### OTEC is key to make hydrogen production cost-effective and efficient

OTEC Innovation Group 14 (Ocean Thermal Energy Cooperation 2014, “Hydrogen Production” http://www.otecinnovationgroup.com/index.php?pID=16)

The huge energy reservoir in the tropical ocean available via the OTEC process will require a transportable form of that energy to allow access to the high energy consuming nations in the temperate zones. **One of the most attractive** and versatile **transportable energy forms is hydrogen**. Once the OTEC process has generated electricity, hydrogen production by electrolysis and liquefaction by the updated Claude process would be the same as with other energy production systems. However, **there are several natural synergies between OTEC and hydrogen production**, especially liquid hydrogen LH2 production, **which other renewables such as wind and solar do not possess**. These include: -**Full and efficient utilization can be made** of the investment in production capacity **because OTEC is available 24 hours per day and 365 days per year**. This is in contrast to most renewable energy systems such as wind, waves, tide, direct solar and photovoltaics. Also, **OTEC systems cannot exhaust the resource at the location where they are installed - in contrast with oil**, natural gas, geothermal or even hydroelectric (the reservoir eventually silts up). -The efficient production of hydrogen by electrolysis requires very pure water for the KOH solution. A small part of the OTEC process can be used to produce this pure water from the surface seawater. -Liquefying hydrogen by the Claude process requires an efficient heat sink to minimize process energy. The cold seawater that is used in the OTEC process provides this efficient heat sink. -Liquid hydrogen is most efficiently transported by ocean tanker. The off-shore OTEC hydrogen plant is already located on the transport medium and therefore would result in the lowest cost for transport to market. From a global perspective, **ocean transport distances of OTEC derived LH2 are much shorter than those currently employed for fossil fuel distribution**. Ultimately, **a global fleet of energy harvesting OTEC plantships** grazing the earth's tropical ocean **could supply the majority of the world's energy needs via hydrogen** or other suitable energy carriers.

#### Transitioning to hydrogen fuel solves oil dependence

AEI 13 (American Energy Independence 2013, “Hydrogen” http://www.americanenergyindependence.com/hydrogen.aspx)

Why hydrogen? Because **hydrogen is a clean universal fuel that** can be used to power cars, trucks, planes, trains, buses, boats and ships. Hydrogen can heat homes and commercial buildings, and generate electricity. Hydrogen **can replace all forms of fossil fuels. A nation that has converted all of its power systems to run on hydrogen will no longer be dependent on oil because hydrogen can be extracted from water. Over 70% of the earth's surface is covered by the oceans of the world**—the average ocean depth exceeds two miles. With modern technology—desalination and electrolysis—human civilization will never run out of water or hydrogen. Water molecules can be separated into pure hydrogen and oxygen through the process of Electrolysis—using electricity as the source of energy to drive the reaction. The electricity can be produced from many different carbon-free sources of energy such as wind, solar, biomass and geothermal as well as nuclear energy. A nation powered by hydrogen will be free to choose from many sources of energy, all of which will produce the one universal fuel: Hydrogen. **Pure hydrogen gas does not exist as a natural resource like oil. You cannot drill for hydrogen or discover it anywhere as a pure gas**. Hydrogen produced today is extracted from natural resources like water (via electrolysis), coal and natural gas (via water-gas shift). In order to extract hydrogen from these existing resources, energy must be spent. For this reason, **Hydrogen is considered a carrier of energy like electricity**, or a store for energy like a battery, **rather than a source of energy like oil.**

#### Oil dependence undermines strategic US leadership

**Electrification Coalition**, ELECTRIFICATION ROADMAP: REVOLUTIONIZING TRANSPORTATION AND ACHIEVING ENERGY SECURITY, 11—**09**, p. 30.

**The importance of oil** in the U.S. economy **has given it a place of prominence in foreign and military policy.** In particular, **two key issues related to oil affect national security. First, the vulnerability of global oil supply lines and infrastructure has driven the United States to accept the burden of securing the world’s oil supply. Second, the importance of large individual oil producers constrains U.S. foreign policy options when dealing with problems in these nations. A crippling disruption to global oil supplies ranks among the most immediate threats to the United States today. A prolonged interruption** due to war in the Middle East or the closure of a key oil transit route **would lead to severe economic dislocation. U.S. leaders have recognized this for decades, and have made it** a matter of **stated policy that the United States will protect the free flow of oil with military force. Still, policy alone has consistently fallen short of complete deterrence, and the risk of oil supply interruptions has persisted for nearly 40 years.** To mitigate this risk, U.S. armed forces expend enormous resources protecting chronically vulnerable infrastructure in hostile corners of the globe and patrolling oil transit routes. This engagement benefits all nations, but comes primarily at the expense of the American military and ultimately the American taxpayer. A 2009 study by the RAND Corporation placed the ongoing cost of this burden at between $67.5 billion and $83 billion annually, plus an additional $8 billion in military operations. 33 In proportional terms, these costs suggest that **between 12 and 15 percent of the current defense budget is devoted to guaranteeing the free flow of oil. Foreign policy constraints related to oil dependence are** less quantifiable, but no less **damaging. Whether dealing with uranium enrichment in Iran, a hostile regime in Venezuela, or an increasingly assertive Russia, American diplomacy is distorted by our need to minimize disruptions to the flow of oil. Perhaps more frustrating, the importance of oil to the broader global economy has made it nearly impossible for the United States to build international consensus on a wide range of foreign policy and humanitarian issues.**

#### Failed leadership causes extinction—no alternative to hegemony

**Brzezinski 12** Zbigniew K. Brzezinski (CSIS counselor and trustee and cochairs the CSIS Advisory Board, holds honorary degrees from Georgetown University, Williams College, Fordham University, College of the Holy Cross, Alliance College, the Catholic University of Lublin, Warsaw University, and Vilnius University. He is the recipient of numerous honors and awards) February 2012 “After America” http://www.foreignpolicy.com/articles/2012/01/03/after\_america?page=0,0

For **if America falters**, the world is unlikely to be dominated by a single preeminent successor -- not even China. International uncertainty, **increased tension** among global competitors, **and** even outright **chaos** **would be** far more **likely** outcomes. While a sudden, massive crisis of the American system -- for instance, another financial crisis -- would produce a fast-moving chain reaction leading to global political and economic disorder**, a steady drift by America into** increasingly pervasive **decay** or endlessly widening warfare with Islam **would be unlikely to produce**, even by 2025, **an effective global successor**. No single power will be ready by then to exercise the role that the world, upon the fall of the Soviet Union in 1991, expected the United States to play: the leader of a new, globally cooperative world order. **More probable would be a protracted phase of rather inconclusive realignments of both global and regional power, with no** grand **winners and many more losers, in a setting of international uncertainty and even of potentially fatal risks to global well-being**. Rather than a world where dreams of democracy flourish, a Hobbesian world of enhanced national security based on varying fusions of authoritarianism, nationalism, and religion could ensue. RELATED 8 Geopolitically Endangered Species The leaders of the world's second-rank powers, among them **India, Japan, Russia, and** some **European countries, are already assessing the potential impact of U.S. decline** on their respective national interests. The Japanese, fearful of an assertive China dominating the Asian mainland, may be thinking of closer links with Europe. Leaders in India and Japan may be considering closer political and even military cooperation in case America falters and China rises. **Russia**, while perhaps engaging in wishful thinking (even schadenfreude) about America's uncertain prospects, **will almost certainly have its eye on the independent states of the former Soviet Union. Europe**, not yet cohesive, **would likely be pulled in several directions:** Germany and Italy toward Russia because of commercial interests, France and insecure Central Europe in favor of a politically tighter European Union, and Britain toward manipulating a balance within the EU while preserving its special relationship with a declining United States. **Others may move more rapidly to carve out their own regional spheres:** Turkey in the area of the old Ottoman Empire, Brazil in the Southern Hemisphere, and so forth. **None of these countries, however, will have the requisite combination of economic, financial, technological, and military power even to consider inheriting America's leading role.** China, invariably mentioned as America's prospective successor, has an impressive imperial lineage and a strategic tradition of carefully calibrated patience, both of which have been critical to its overwhelmingly successful, several-thousand-year-long history. China thus prudently accepts the existing international system, even if it does not view the prevailing hierarchy as permanent. It recognizes that success depends not on the system's dramatic collapse but on its evolution toward a gradual redistribution of power. Moreover, the basic reality is that **China is not yet ready to assume in full America's role in the world**. Beijing's leaders themselves have repeatedly emphasized that on every important measure of development, wealth, and power, **China will still be a modernizing and developing** state **several decades from now, significantly behind not only the United States but also Europe and Japan in the major per capita indices of modernity and national power**. Accordingly, **Chinese leaders have been restrained in laying any overt claims to global leadership.** At some stage, **however, a more assertive Chinese nationalism could arise** and damage China's international interests**. A swaggering, nationalistic Beijing would unintentionally mobilize a powerful regional coalition against itself.** None of China's key neighbors -- India, Japan, and Russia -- is ready to acknowledge China's entitlement to America's place on the global totem pole. **They might even seek support from a waning America to offset an overly assertive China. The resulting regional scramble could become intense, especially given the similar nationalistic tendencies among China's neighbors. A phase of acute international tension in Asia could ensue. Asia** of the 21st century **could then begin to resemble Europe of the 20th century -- violent and bloodthirsty.** At the same time, **the security of a number of weaker states** located geographically next to major regional powers also **depends on the international status quo reinforced by America's global preeminence** -- and would be made significantly more vulnerable in proportion to America's decline. The states in that exposed position -- **including Georgia, Taiwan, South Korea, Belarus, Ukraine, Afghanistan, Pakistan, Israel, and the greater Middle East** -- are today's geopolitical equivalents of nature's most endangered species. **Their fates are closely tied to the nature of the international environment left behind by a waning America, be it ordered and restrained or, much more likely, self-serving and expansionist. A faltering United States could also find its strategic partnership with Mexico in jeopardy.** America's economic resilience and political stability have so far mitigated many of the challenges posed by such sensitive neighborhood issues as economic dependence, immigration, and the narcotics trade. **A decline in American power, however, would likely undermine the health and good judgment of the U.S. economic and political systems. A waning United States would likely be more nationalistic, more defensive about its national identity, more paranoid about its homeland security, and less willing to sacrifice resources for the sake of others' development**. The worsening of relations between a declining America and an internally troubled Mexico could even give rise to a particularly ominous phenomenon: the emergence, as a major issue in nationalistically aroused Mexican politics, of territorial claims justified by history and ignited by cross-border incidents. **Another consequence of American decline could be a corrosion of the generally cooperative management of the global commons** -- **shared interests such as sea lanes, space, cyberspace, and the environment, whose protection is imperative to the long-term growth of the global economy and the continuation of basic geopolitical stability.** In almost every case, **the potential absence of a constructive and influential U.S. role would fatally undermine the essential communality of the global commons because the superiority and ubiquity of American power creates order where there would normally be conflict**. None of this will necessarily come to pass. Nor is the concern that America's decline would generate global insecurity, endanger some vulnerable states, and produce a more troubled North American neighborhood an argument for U.S. global supremacy. In fact, the strategic complexities of the world in the 21st century make such supremacy unattainable. But those dreaming today of America's collapse would probably come to regret it. And as **the world after America would be increasingly complicated and chaotic,** it is imperative that the United States pursue a new, timely strategic vision for its foreign policy -- or start bracing itself for a dangerous slide into global turmoil.

#### Oil dependence kills U.S. leverage over Iran

**Luft 05** – DR. GAL LUFT, EXECUTIVE DIRECTOR @ INSTITUTE FOR THE ANALYSIS OF GLOBAL SECURITY (IAGS), CO-CHAIR @ SET AMERICA FREE COALITION, “America’s oil dependence and its implications for U.S. Middle East policy,” SENATE FOREIGN RELATIONS SUBCOMMITTEE ON NEAR EASTERN AND SOUTH ASIAN AFFAIRS, 10-20-05. http://www.foreign.senate.gov/imo/media/doc/LuftTestimony051020.pdf. LAP

**The growing economic power of OPEC producers enables them to resist U.S. pressure on a variety of issues** **from human rights to nuclear proliferation.** As the second largest oil producer and holder of 10 percent of the world’s proven oil reserves **Iran is fully aware of the power of its oil.** Its supreme leader Ayatollah Ali **Khamenei warned** in 2002: “**If the west did not receive oil, their factories would grind to a halt.** This will shake the world!" The **Iranians** also **know that oil is their insurance policy and that the best way to forestall U.S. efforts in the UN is by bedding themselves with energy hungry powers such as Japan** and the two fastest growing energy consumers—China and India. After securing the support of a third of humanity the Iranians are unfazed by the pressure coming from the U.S. and the EU. Last month Iran’s President Mahmoud Ahmadinejad warned that Iran could wield the oil weapon if Tehran's case was sent to the Security Council for possible sanctions.

Mr. Chairman, Four years after September 11 it is essential that we view our geopolitical situation in the context of our oil dependence and realize that **it will be extremely difficult to win the war on terror and spread democracy** around the world **as long as we continue to send petrodollars to those who do not share our vision and values.** As long as the U.S. remains dependent on oil to the degree that its does today, its dependence on the Middle East will grow. The U.S. can no longer afford to postpone urgent action to strengthen its energy security and it must begin a bold process toward reducing its demand for oil.

#### Iran is developing nuclear weapons—recent intelligence confirms

**Jahn 12** (George, staff writer 9/11/12, “Diplomats say UN agency has new intelligence Iran worked on nuclear arms” Associated Press) http://www.edmontonjournal.com/news/Exclusive+Diplomats+agency+intelligence+Iran+worked+nuclear/7225282/story.html

VIENNA - **The U.N. atomic agency has received new and significant intelligence over the past month that Iran has moved further toward the ability to build a nuclear weapon**, diplomats tell The Associated Press. They say the **intelligence shows that Iran has advanced its work on calculating the destructive power of an atomic warhead through a series of computer models** that it ran sometime within the past three years. The diplomats say **the information comes from Israel, the U**nited **S**tates **and at least two other Western countries** and concludes that the work was done sometime within the past three years. The time-frame is significant because if the International Atomic Energy Agency decides that the intelligence is credible, it would strengthen its concerns that **Iran has continued weapons work into the recent past — and may be continuing to do so.**  Because computer modeling work is normally accompanied by physical tests of the components that go into a nuclear weapons, it would also buttress IAEA fears outlined in detail in November that **Tehran is advancing its weapons research on multiple fronts.**

#### Iran prolif causes extinction

**Rubin 9** – (Barry, Prof @ the Interdisciplinary Center, Director of the Global Research in International Affairs, Research Director of the IDC's Lauder School of Government, Diplomacy, and Strategy, “What if Iran gets a working nuclear weapon? How Middle East crisis would hit U.S.,” http://www.nydailynews.com/news/national/2009/03/09/2009-03-09\_what\_if\_iran\_gets\_a\_working\_nuclear\_weap.html)

**If and when Iran** **gets nuclear weapons it would set off a global nightmare**. Most obviously, **Iran could use nuclear arms to attack Israel**. It’s easy to say that Iran’s leaders would be cautious, but **what if ideology, error, or an extremist faction decides to wipe the Jewish state off the map**? **Even a 10-percent chance of nuclear holocaust is terrifying**. And if Israel decides its existence is at risk, **it would launch a preemptive attack that would also produce a big crisis**. That’s just for starters. Once Iran has nuclear weapons, **every Arab state**, with the exception of Iran’s ally Syria, **would also be imperiled**. **Those countries would beg for U.S. protection**. But could they depend on America, under the Barack Obama administration, to go to war – especially a nuclear one – to shield them? Uncertain of U.S. reliability, these governments would rush to appease Iran. To survive, the **Arab states will do whatever Iran wants** – which would come at high cost for America: **alliances would weaken and military bases would close down**. No Arab state would dare support peace with Israel, either. But **Arab states wouldn’t feel safe with just appeasement**. **An arms’ race would escalate in which several other countries would try to buy or build nukes of their own**. **Tension, and chance for nuclear war**, **whether through accident or miscalculation, would soar. The** **U**nited **S**tates **would eventually have to get dragged in**. European allies would also be scared. As reluctant as they are to help America in the Middle East, that **paralysis would get worse**. As willing as they are to appease Tehran, they’d go far beyond that. Meanwhile, **an emboldened Iran would push to limit oil and gas production and increase prices**. Other oil producers would feel compelled to move away from their former, more responsible practices. Consumers’ fears would push up the prices further. Yet there’s worse. Flush with a feel of victory, **Iran and its allies** — Syria, Hamas, Hezbollah, and Iraqi insurgents — **would recruit more members to its cause**. These **terrorist groups would interpret the retreat** **of** more moderate Arab countries and **the West as signs of weakness and use it to fuel more aggression**. **Such a terrible scenario is likely even if Iran never actual uses a nuclear weapon on another country**. **This new era** in the Middle East **would bring risks and the probability of war** for America **that would dwarf all the region’s** current **troubles and** the **crises faced by the U**nited **S**tates in the whole world. And that’s why it’s so important to avoid Iran getting nuclear weapons in the first place.

### Hydrogen Adv: Solvency

**OTEC hydrogen will work and can replace oil**

Energinat 14 (Energinat: Optimal Management of Natural Energy Resources for the Benefit of the People of Haiti: Hydrogen 2014, “Production” http://energinat.com/future\_hydrogen.shtml)

The idea of utilizing hydrogen as a promising energy carrier is not new. Jules Verne, one of the world’s greatest visionaries, wrote in 1874 in The Mysterious Island: “I believe that water will one day be employed as fuel, that hydrogen and oxygen will furnish an inexhaustible source of heat and light.” Since then, the idea gained ground and today it is generally agreed that hydrogen is the fuel of the future. Despite challenges such as its storage and conversion, hydrogen remains a promising energy carrier and storage medium. It is environmentally friendly as water is the exhaust, renewable, reliable and as safe as gasoline, diesel or natural gas; also, it reduces dependence on fossil fuels, thereby preventing the depletion of fossil fuel reserves, and can be produced in any country from a variety of domestically available energy sources – coal, natural gas, biomass and water. In the case of water, electricity may be used to produce hydrogen via electrolysis. In the mid 1980’s the Lockheed Corporation recognized that the efficient production of hydrogen by electrolysis requires both electricity and very pure water. Having participated in the construction of Mini-OTEC in 1978, **Lockheed** also **recognized that a** closed-cycle **hybrid OTEC system**, unlike most renewable energy systems such as photovoltaics, wind and tide, **can generate electricity day and night, and from season to season, in addition to producing significant quantities of pure, fresh water as a bonus byproduct. This has led Lockheed to propose to build several 500 MW OTEC plants** on floating platforms **in** three tropical locations, namely **the tropical east Pacific, the Gulf of Mexico and the Caribbean. The electricity generated by these plants would serve to produce hydrogen by electrolysis and the hydrogen would be liquefied and transported** cryogenically by liquid hydrogen (LH2) tankers. Soon after making this proposal, however, Lockheed decided to abandon the OTEC hydrogen project. We therefore contemplate producing liquid hydrogen on a small scale in Haiti on one of the five deep ocean water (DOW) sites identified along the coast of the country by constructing an onshore OTEC hydrogen plant that will be economically viable. **It is expected that the continually rising oil prices will make future economic conditions favorable for the development of OTEC hydrogen**. The liquid hydrogen produced would be stored in vacuum-insulated spherical tanks, transported to different regions of the country and possibly to the neighboring Dominican Republic via tanker trucks and used to power cars, buses, motorcycles and even boats equipped with fuel cells.

### Hydrogen Adv: A2 “Hydrogen Tech Fails”

**Even if hydrogen isn’t ready immediately development is speeding up**

**ICCT 2013** – The international Council on Clean Transportation (December 4, “Is hydrogen transportation gaining momentum?” <http://www.theicct.org/blogs/staff/hydrogen-transportation-gaining-momentum>)

Still, all of the **recent trends are promising**. According to DOE, **projected fuel cell costs for high volume production have come down dramatically** from $275/kW in 2002 to $47/kW in 2012. The DOE goal is to reduce the fuel cell cost to $30/kW. **Given continued R&D efforts, we can achieve this cost target in the future, if not exceeded**. For example, **the number of patents issued on fuel cells has been steadily increasing**, from about 350 patents in 2002 to about 1000 patents in 2012. **On the durability side, on average the current generation of fuel cells last for about 2,500 hours** (equivalent to 62,500 miles). While **this is a big improvement from years ago**, there is still a way to go to achieve the desired durability of about 5,000 hours or more. As to storage, currently, the most common method is compressed hydrogen. **To enhance hydrogen storage capacity, research on alternative technologies** such as chemical storage in the form of metal hydride, ammonia, ionic liquid, formic acid, carbon nanotubes and glass microspheres **has been ongoing**. Still, **with future improvements in fuel cell efficiency and reductions in vehicle weight, rolling resistance and aerodynamic drag, it is anticipated that compressed hydrogen storage would provide adequate vehicle range**.

**Hydrogen commercialization is happening now – advancements in business partnerships**

**Gagliano 2013** - Infrastructure Business Development Specialist at the California Fuel Cell Partnership (date obtained from most recent citation, Joe, “Beginning the Commercialization of Hydrogen Fuel Cell Electric Vehicles” <http://fuelmarketernews.com/beginning-commercialization-hydrogen-fuel-cell-electric-vehicles-2/>)

**Considerable progress towards the commercialization of fuel cell vehicles has been achieved in the last year**. In addition, a number of **automotive strategic partnerships were formed in 2013 to jointly develop hydrogen fuel cell technology**. These include Toyota and BMW; Daimler, Ford and Nissan; and Honda and GM. Hyundai announced its 2014 Tucson Fuel Cell vehicle launch in California in Spring 2014. And Toyota and Honda unveiled their production and concept fuel cell electric vehicles for introduction in 2015. **California announced on May 1 $46.6 million in proposed awards for 28 new hydrogen fueling stations, expanding the state’s network to over 50 stations** by November 2015. Fifteen new hydrogen filling stations are scheduled to become operational in California by December 2014. Kalibrate (formerly KSS Fuels) will be conducting a DOE funded study of retail hydrogen fueling stations in California which is expected to be completed in December of 2014. **Toyota and Honda will be introducing their next generation commercial FCEVs to the market in 2015**. And Mercedes and Nissan will be introducing their next generation FCEVs in 2017. Beyond California at the national level, **a new public-private initiative, H2USA, was launched by the Department of Energy** in May of 2013. Through section 177 of the Clean Air Act, other states can adopt California’s car emission standards. Currently, **nine other states have adopted California’s ZEV program to help achieve their quality goals.** The states include New York, Massachusetts, Maine, Rhode Island, Connecticut, Vermont, New Jersey, Maryland and Oregon. H2 USA will be focusing on the issues associated with future introduction of hydrogen fuel cell vehicles in these states. **Fuel cell electric vehicles are ready for their commercial launch**. To support their launch, retail-focused hydrogen infrastructure is being developed throughout California, presenting business opportunities for both fuel retailers and fuel marketers doing business in the state. And **beyond California, H2USA will be focusing on a national launch of hydrogen fuel cell vehicles in the near future. Stay tuned**.

### Hydrogen Adv: A2 “Energy Independence High”

#### Our energy policy is failing now—we’re increasingly dependent on foreign sources

**Manjarres 09** (Javier, political writer, 9/22/9, “Offshore Drilling is an Essential Step Towards Energy Independence” Red County) http://www.redcounty.com/node/32160

**To say that the national energy policy formulated by the United States Congress has been both incoherent and self-defeating over the past three decades would be an understatement of epic proportions. Well intentioned but misguided legislation and regulation has not only made gasoline more expensive and the nation more dependent on foreign oil**, it has also managed to impede technological innovation, destabilize energy prices, and fail to substantially improve environmental protection. **In addition to all of the unintended consequences of our misguided energy policy, we have had to deal with the consequences of a self-imposed ban on drilling along most of our coastline since the early 1980s. Congress’ misguided regulation of the energy industry has achieved pretty much the exact opposite outcomes that logical people would hope for**; and taken cumulatively, it’s hard to deny that Congressional ineptitude has made things worse for the average American. For over three decades, **we’ve heard endless rhetoric from politicians lamenting our dependence on foreign oil— yet over that same time span, Congress has enacted legislation that has resulted in a 25% decline in domestic oil production while our oil consumption has increased 20%. The statistics are clear— we’ve failed in our stated intentions to become less dependent on foreign oil, and our domestic production margins have only gotten worse**. When gas was recently topping $4 a gallon, the call for offshore drilling intensified, and it appeared that the political class was poised to take appropriate action. Now, with gas prices back down to a “tolerable” level, the public outcry for exploration and drilling has subsided, and politicians in Washington D.C. have moved to reinstate the ban on outer-continental shelf drilling. But make no mistake, our vulnerability on this issue is just as serious as it was prior to the last spike in oil prices. The case for ending the ban on offshore drilling needs to made convincingly— independent of what the current price of a barrel of oil happens to be. But put aside our self-imposed national paralysis about oil and energy policy for a moment. Is it **realistic to conclude that other developing nations in the world will cease their own oil exploration and production while our politicians continue to play an unending game of semantics, blame shifting, and denial? If we make the wrong choice as a nation and continue our inaction, not only will we be less prosperous financially, we will also be more vulnerable from a security standpoint as well. Our country has to get serious about energy independence now, otherwise we will continue to be held hostage to the whims of rogue regimes and the terrorists that they finance.**

### Hydrogen Adv: A2 “Iran Won’t Attack”

#### Nuclear Iran can’t be deterred—demographic decline means no rational self-interest

**Goldman 11** – Interview between Front Page Magazine and David P. Goldman, “How Civilizations Die,” FRONT PAGE MAGAZINE, 11-14-11. http://frontpagemag.com/2011/jamie-glazov/how-civilizations-die/. LAP

Goldman: With a hard hand, in the case of Iran. The foreign policy establishment has always seen Iran as a rational player. That was the view that Robert Gates brought into the Bush administration, and the reason that the Obama administration refused, disgracefully, to support the democracy movement that erupted in Iran in the summer of 2009.

An individual, or **a country**, **that knows it has no future has no rational self-interest. You can’t invert the population pyramid in a poor country within a single generation without economic collapse. Iran knows its time is running out.** Ahmadinejad is giving speeches calling the low birth rate a “genocide against the Iranian nation,” and **Iran’s press is warning of a “tidal wave of elderly.” That feeds the apocalyptic impulse of Iran’s leaders.** There weren’t a lot of Communists in Russia outside the Politbureau, we discovered in 1989, and there may not be a lot of Muslims in Iran. But the Russian danger peaked in the early 1980s when the Politbureau realized that time was running out to make their move.

**Demographic decline tells the ayatollahs that their window of opportunity is closing.** But there’s a big difference. **Deterrence worked with** a nuclear-armed **Russia. It won’t work with the apocalyptic Shi’ite leadership of Iran.** As a practical matter, **we must stop Iran from getting nuclear weapons, no matter how great the cost.**

## Adv: Warming

### Warming Adv: 1AC

**Warming is real, anthropogenic, and threatens extinction – CONSENSUS goes aff**

Richard **Schiffman 9/27**/13, environmental writer @ The Atlantic citing the Fifth Intergovernmental Panel on Climate Change, “What Leading Scientists Want You to Know About Today's Frightening Climate Report,” The Atlantic, http://www.theatlantic.com/technology/archive/2013/09/leading-scientists-weigh-in-on-the-mother-of-all-climate-reports/280045/

**The polar icecaps are melting faster than we thought they would; seas are rising faster than we thought they would; extreme weather events are increasing.** Have a nice day! **That’s a** less than scientifically rigorous **summary of the findings of the** Fifth Intergovernmental Panel on Climate Change (**IPCC**) **report released this morning** in Stockholm.¶ Appearing exhausted after a nearly two sleepless days fine-tuning the language of the report, **co-chair Thomas** **Stocker called climate change “the greatest challenge of our time,"** adding that **“each of the last three decades has been successively warmer than the past,” and** that **this trend is likely to continue into the foreseeable future.**¶ Pledging further action to cut carbon dioxide (CO2) emissions, U.S. Secretary of State John Kerry said, "This isn’t a run of the mill report to be dumped in a filing cabinet. **This isn’t a political document produced by politicians... It’s science."¶** And that science needs to be communicated to the public, loudly and clearly. I canvassed leading climate researchers for their take on the findings of the vastly influential IPCC report. What headline would they put on the news? What do they hope people hear about this report?¶ When I asked him for his headline, Michael **Mann, the Director of the Earth Systems Science Center at Penn State** (a former IPCC author himself) **suggested**: **"Jury In: Climate Change Real, Caused by Us, and a Threat We Must Deal With."**¶ Ted Scambos, a glaciologist and head scientist of the National Snow and Ice Data Center (NSIDC) based in Boulder would lead with: "IPCC 2013, Similar Forecasts, Better Certainty." While **the report**, which is issued every six to seven years, offers no radically new or alarming news, Scambos told me, it **puts an exclamation point on what we already know, and refines our evolving understanding of global warming.¶** **The IPCC,** the indisputable rock star of UN documents, serves as the basis for global climate negotiations, like the ones that took place in Kyoto, Rio, and, more recently, Copenhagen. (The next big international climate meeting is scheduled for 2015 in Paris.) It **is** also arguably **the most elaborately vetted and exhaustively researched scientific paper in existence.** Founded in 1988 by the United Nations and the World Meteorological Organization, the **IPCC represents the distilled wisdom of over 600 climate researchers in 32 countries** on changes in the Earth’s atmosphere, ice and seas. It endeavors to answer the late New York mayor Ed Koch’s famous question “How am I doing?” for all of us. The answer, which won’t surprise anyone who has been following the climate change story, is not very well at all. ¶ **It is now 95 percent likely that human spewed heat-trapping gases — rather than natural variability — are the main cause of climate change**, according to today’s report. In 2007 the IPCC’s confidence level was 90 percent, and in 2001 it was 66 percent, and just over 50 percent in 1995. ¶ What’s more, **things are getting worse more quickly than almost anyone thought would happen a few years back.¶** “If you look at the early IPCC predictions back from 1990 and what has taken place since, climate change is proceeding faster than we expected,” Mann told me by email. Mann helped develop the famous hockey-stick graph, which Al Gore used in his film “An Inconvenient Truth” to dramatize the sharp rise in temperatures in recent times. ¶ Mann cites the decline of Arctic sea ice to explain : “**Given the current trajectory, we're on track for ice-free summer conditions in the Arctic in a matter of a decade or two**... There is a similar story with the continental ice sheets, which are losing ice — and contributing to sea level rise — at a faster rate than the [earlier IPCC] models had predicted.”¶ But there is a lot that we still don’t understand. Reuters noted in a sneak preview of IPCC draft which was leaked in August that, while the broad global trends are clear, climate scientists were “finding it harder than expected to predict the impact in specific regions in coming decades.”¶ From year to year, the world’s **hotspots** are not consistent, but **move erratically around the globe.** The same has been true of heat waves, mega-storms and catastrophic floods, like the recent ones that ravaged the Colorado Front Range. **There is broad agreement that climate change is increasing the severity of extreme weather events,** but we’re not yet able to predict where and when these will show up. ¶ **“It is like watching a pot boil,”** Danish astrophysicist and climate scientist Peter Thejll told me. “**We** understand why it boils but **cannot predict where the next bubble will be.”¶** There is also uncertainty about an apparent slowdown over the last decade in the rate of air temperature increase. **While some critics claim that global warming has “stalled,”** others point out that, **when rising ocean temperatures are factored in, the Earth is actually gaining heat faster than previously anticipated.¶** **“Temperatures measured** over the short term **are just one parameter**,” said Dr Tim Barnett of the Scripps Institute of Oceanography in an interview. “**There are far more critical things going on;** the **acidification of the ocean is happening a lot faster than anybody thought that it would, it’s sucking up more CO2, plankton, the basic food chain of the planet, are dying, it’s such a hugely important signal**. Why aren’t people using that as a measure of what is going on?”¶ Barnett thinks that recent **increases in volcanic activity**, which spews smog-forming aerosols into the air that deflect solar radiation and cool the atmosphere, **might** help **account for the temporary slowing of global temperature rise.** But he says we shouldn’t let short term fluctuations cause us to lose sight of the big picture.¶ The dispute over temperatures underscores just how formidable the IPCC’s task of modeling the complexity of climate change is. Issued in three parts (the next two installments are due out in the spring), the full version of the IPCC will end up several times the length of Leo Tolstoy’s epic War and Peace. Yet every last word of the U.N. document needs to be signed off on by all of the nations on earth. ¶ “**I do not know of any other area** of any complexity and importance at all **where there is unanimous agreement**... **and the statements so strong**,” Mike MacCracken, Chief Scientist for Climate Change Programs, Climate Institute in Washington, D.C. told me in an email. “What IPCC has achieved is remarkable (and why it merited the Nobel Peace Prize granted in 2007).”¶ Not surprisingly, **the IPCC’s conclusions tend to be “conservative by design,”** Ken Caldeira, an atmospheric scientist with the Carnegie Institution’s Department of Global Ecology told me: “**The IPCC is not supposed to represent the controversial forefront of climate science. It is supposed to represents what nearly all scientists agree on, and it does that quite effectively.”¶** Nevertheless, even these understated findings are inevitably controversial. Roger Pielke Jr., the Director of the Center for Science and Technology Policy Research at the University of Colorado, Boulder suggested a headline that focuses on the cat fight that today’s report is sure to revive: "Fresh Red Meat Offered Up in the Climate Debate, Activists and Skeptics Continue Fighting Over It." Pielke should know. A critic of Al Gore, who has called his own detractors "climate McCarthyists," Pielke has been a lightning rod for the political controversy which continues to swirl around the question of global warming, and what, if anything, we should do about it. ¶ The public’s skepticism of climate change took a dive after Hurricane Sandy. Fifty-four percent of Americans are now saying that the effects of global warming have already begun. But 41 percent surveyed in the same Gallup poll believe news about global warming is generally exaggerated, and there is a smaller but highly passionate minority that continues to believe the whole thing is a hoax. ¶ **For** most **climate experts**, however, **the battle is long over — at least when it comes to the science**. What remains in dispute is not whether climate change is happening, but how fast things are going to get worse.¶ There are some possibilities that are deliberately left out of the IPCC projections, because we simply don’t have enough data yet to model them. Jason Box, a visiting scholar at the Byrd Polar Research Center told me in an email interview that: “**The scary elephant in the closet is** terrestrial and **oceanic methane release** triggered by warming.” The IPCC projections don’t include the possibility — some scientists say likelihood — that huge quantities of methane (a greenhouse gas thirty times as potent as CO2) will eventually be released from thawing permafrost and undersea methane hydrate reserves. Box said that **the threshhold “when humans lose control of potential management of the problem, may be sooner than expected.”¶** Box, whose work has been instrumental in documenting the rapid deterioration of the Greenland ice sheet, also believes that **the latest IPCC predictions** (of a maximum just under three foot ocean rise by the end of the century) **may turn out to be wildly optimistic**, if the Greenland ice sheet breaks up. “**We are heading into uncharted territory”** he said. **“We are creating a different climate than the Earth has ever seen.”** ¶ The head of the IPCC, Rajendra Pachauri, speaks for the scientific consensus when he says that **time is fast running out to avoid the catastrophic collapse of the natural systems on which human life depends.** What he recently told a group of climate scientist could be the most chilling headline of all for the U.N. report: ¶ **"We have five minutes before midnight."**

**OTEC is key to solve warming – resource abundance, central refrigeration, and global accessibility all make it particularly well-suited to tackle C02 emissions**

Websdale Communications Support Officer at The Wildlife Trusts 3/5/14 (Emma Websdale, “OTEC Can Help Countries Get Serious About Climate Change,” Empower the Ocean, http://empowertheocean.com/otec-climate-change/) LR

As these changes in lifestyle and political commitment make clear, **countries across the globe are serious about making sustainable changes.** **One technology that can benefit nearly all of these locations by helping them reach their clean-energy and emission-reduction targets is Ocean Thermal Energy Conversion (OTEC).**  **By tapping into our most abundant resource, our oceans, OTEC can allow us to meet energy and water demands sustainably by utilizing temperature differences between warm surface water and cold deep water, all without the use of fossil fuels.** With the thermal resources of the ocean available day and night, and with only relatively small variations from summer to winter, **OTEC can produce clean energy 24 hours a day, seven days a week, giving it a great advantage over other important, yet intermittent, renewable-energy sources. OTEC’s ability to help countries reduce their energy-related carbon dioxide emissions is staggering.** **One 10-MW OTEC plant alone can provide clean, reliable energy for approximately 10,000 people, replacing the burning of 50,000 barrels of oil and preventing the release of 80,000 tons of CO2 per year into the atmosphere.** When the plant’s energy is not in demand, that same 10-MW plant can produce as much as 75 million liters of fresh drinking water on a daily basis via desalination (removing salt and other minerals from seawater). Worldwide, the surge in proposals, bidding, and deployment of desalination plants reflects an awareness of the climate-proof potential for desalination and its capacity to separate industrial water demand from public water supplies. Already, countries including the United States, Australia, and China manage water shortages via desalination plants. Meanwhile, countries such as the United Arab Emirates, India, Chile, and Saudi Arabia recognize the crucial role of desalination and have plans to build plants in the near future. **By using the deep cold water in OTEC plant pipes, energy-intensive central refrigeration methods can be replaced by Seawater Air Conditioning (SWAC), helping countries reach emission-reduction targets. For large buildings and hotels,** particularly in tropical climates, **air conditioning (AC)** is the single greatest demand on energy and **is responsible for 10% of global carbon emissions.** Seawater Air Conditioning (SWAC), by comparison, has been proven to deliver huge energy savings (up to 90%) and to reduce cooling-associated emissions significantly. **OTEC’s services can be delivered worldwide. Its global importance is recognized by the National Renewable Energy Laboratory (NREL) of the United States Department of Energy (DOE),** which has listed 68 countries and 29 territories as suitable candidates for OTEC plants. Furthermore, a study performed by Dunbar identified 98 territories with access to the OTEC thermal resource. **With OTEC plants offering products and services including clean energy, fresh drinking water, and energy-saving air conditioning, the technology is perfectly positioned to help countries successfully restrict fossil fuel use and move toward clean energy.**

#### OTEC is the most effective renewable for counteracting warming – no emissions, increased absorption, and fuel efficiency

**Curto 10** (Dr. Paul, former NASA Chief Technologist, “American Energy Policy V -- Ocean Thermal Energy Conversion,” 12/15/10, http://www.opednews.com/articles/American-Energy-Policy-V--by-Paul-from-Potomac-101214-315.html)

**OTEC is a true triple threat against global warming. It is the only technology that acts to directly reduce the temperature of the ocean** (it was estimated one degree Fahrenheit reduction every twenty years for 10,000 250 MWe plants in '77), **eliminates carbon emissions, and increases carbon dioxide absorption** (cooler water absorbs more CO2) at the same time. **It generates fuel that is portable and efficient, electricity for coastal areas if it is moored, and possibly food from the nutrients brought up from the ocean floor. It creates jobs, perhaps millions of them, if it is the serious contender for the future multi-trillion-dollar energy economy.** In concert with wind and solar power, **OTEC will complete the conversion of the human race to a balance with Nature.** We need only choose life over convenience.

Some folks know that I've been a proponent of ocean power since the late '70s. Rummaging through old stuff on the internet, I found this ancient photo of me in Miami in 1977, on a panel discussing OTEC. This may have been the first time that OTEC was discussed in public in terms of global warming. Oddly enough, the concern was that we might cause an Ice Age!

Here is the document, which describes the technology quite well at that point in time, more than 30 years ago: otec\_liaison\_1\_613.pdf We should be more worried about **global warming upsetting the ocean currents by overheating the ocean**, which **is now happening at an alarming rate**. The latest guess is +5C (9F) by 2100! **This technology may be deployed as a means to bring the ocean back into balance**, not to upset it. The **designs for these OTEC ships have features that are quite innovative and cost effective**. Estimates range from $3000 to $6000 per kWe installed in 2010 dollars, depending on the configuration and proximity to shore. The capacity factor should be close to 100%, especially with the modular designs for the power modules. This means that **OTEC annual power production will average three times that of solar and wind per unit of power capacity**. Gulf plants may be moored in deep water and connected directly to the grid, bypassing the ammonia step. Tropical ships may graze from site to site and perform stationkeeping to stay in place when it's advantageous to do so. One design called for neutrally buoyant hulls to allow for submerging the ship in the event of any major storm to levels below the wave action zone. The major expenses are for the heat exchangers (titanium alloys or aluminum), cold water pipe, and ammonia production/electrical generation and transmission facilities.

#### Only OTEC can tackle warming in the timeframe necessary to prevent positive feedbacks

**Baird 13** (Jim Baird, Owner and Partner of the Global Warming Mitigation Method, “OTEC and Energy Innovation: The Willie Sutton Approach,” The Energy Collective, 5/15/13, http://theenergycollective.com/jim-baird/221801/energy-willie-suttonwill-rogers-approach)

Expanding oceans have no place to go but up onto the land and warming oceans and air melt the polar icecaps which exacerbates the sea level problem. **Contrary to the IEA's recent report that we have five years to prevent "dangerous" climate change, a Canadian Centre for Climate Modelling and Analysis study concluded that even if we stopped putting CO2 into the atmosphere today the seas may rise by at least four metres, over the next 1,000 years.** The insurance company Allianz has estimated that $28 trillion worth of infrastructure will be at risk by as early as 2050 and the outlook for Small Island States is bleak. Increasing evaporation is another consequence of warming oceans and the conventional wisdom has been this moisture produces cloud cover and an albdedo effect that will produce ocean cooling. A recent study however indicates that this may in fact be wrong and instead **warming oceans transfer heat to the overlying atmosphere, thinning out the low-lying clouds to let in more sunlight that further warms the ocean.** This feedback warms both the air and water and may lead to thermal runaway and catastrophe. As Will Rogers was wise enough to note: Unfortunately, **many of the actions proposed in response to global warming are likely to do more harm than good.**

Fusion has been referred to as the holy grail of energy because it mimics the sun which is the source of virtually all of our power but for fission. The problem is like fission; fusion boils water to produce electricity which is a process that is only about 33 percent efficient.

Richard Smalley, Nobel Laureate in Chemistry, estimated a population of 10 billion by the year 2050 will require as much as 60 terawatts to meet its needs, including massive desalination.

To produce this 60 terawatts with either fission or fusion an additional 120 terawatts of waste heat would be produced, most of which would end up in the ocean, exacerbating thermal expansion and accelerating the collapse of the West Antarctic ice sheet.

Solar panels, wind and hydro do not produce waste heat but neither do they remedy sea level rise, thermal runaway or our dying oceans. **Only one energy source, Ocean Thermal Energy Conversion (OTEC) converts accumulating ocean heat to energy, produces renewable energy 24/7, eliminates carbon emissions, and increases carbon dioxide absorption** (cooler water absorbs more CO2). **A NASA study recently published in Nature determined the average amount of energy the ocean absorbed each year over the period 1993 to 2008 was enough to power nearly 500 100-watt light bulbs for each of the roughly 6.7 billion people on the planet.**

**This 330 terawatts is about 20 times the total amount of primary energy consumed globally every year.**

### Warming Adv: Solvency Ext.

**OTEC is the most effective green tech to solve warming – storage space and availability**

**Websdale** Communications Support Officer at The Wildlife Trusts **6/17/**14 (Emma Websdale, “5 Reasons Why Hundreds of People Think OTEC Is a Smart Investment,” Empower the Ocean, http://empowertheocean.com/otec-investment/) LR

Ocean Thermal Energy Conversion (**OTEC) is more than just a technology that produces clean energy.** **With OTEC, the goal is to create a sustainable future using the world’s most abundant resource – our oceans. It’s also about believing in a cleaner, safer future**. **OTEC investment offers reduced carbon emissions, lighter environmental impact and less dependence on fossil fuels.** That’s why our 300+ accredited investors spur OTEC on, and that’s why they care. Take a look at their top five reasons for investing in OTEC: 1**) OTEC is 24/7: More Competitive Than Other Renewables Due to the unlimited availability of the ocean’s thermal resource** **–the fuel that powers OTEC –this technology is built to produce clean energy 24 hours a day, 7 days a week**. **This provides a great advantage over intermittent** (albeit important) **renewable technologies such as solar and wind.** **OTEC also can shrug off the storage problems that are often associated with clean energy**. Due to its ability to produce a range of secondary services, the surplus energy generated by an OTEC plant can be diverted to power desalination plants (removing salt and other minerals to produce drinking water). This flexibility ensures that **OTEC-produced energy never goes to waste**. **It also makes OTEC more dependable as an investment and means greater financial returns for investors**, as OTEC’s clean energy and water are in constant supply. Another major competitive benefit of OTEC is its range of secondary services. Besides producing electricity and fresh drinking water, OTEC can support agriculture and aquaculture industries, reducing local demand on water supplies. It can also slash costs of air conditioning in tropical regions.

**Potential to solve climate change is enormous**

**Websdale** Communications Support Officer at The Wildlife Trusts **6/17/**14 (Emma Websdale, “5 Reasons Why Hundreds of People Think OTEC Is a Smart Investment,” Empower the Ocean, http://empowertheocean.com/otec-investment/) LR

**More than 70% of the earth’s surface is covered by water, and over 80% of the sun’s energy is stored within surface waters -the equivalent of 4,000 times the energy used in the world per day. In just one 24-hour period, tropical ocean waters absorb solar radiation equal to the energy produced by 250 billion barrels of oil. OTEC’s ability to help reduce our dependence on fossil fuels –one of the largest human-induced contributors to climate change – is enormous.** Just one 10-MW OTEC plant has been estimated to provide reliable clean energy for approximately 10,000 people and to replace the burning of 50,000 barrels of oil and release of 80,000 tons of carbon dioxide (CO2) per year into the atmosphere. **OTEC plants therefore may play a huge role in helping global communities fight** pollution-related **climate change. OTEC can also use deep water as a cooling agent for environmentally friendly air conditioning**, a system known as Seawater Air Conditioning (SWAC). To replace traditional electric chillers and chemicals for cooling buildings, **OTEC plants** use cold water from deep oceans and lakes. Their installation into airports, medical centers and holiday resorts **can reduce electricity usage by up to 90% compared to conventional systems, offering enormous reductions in carbon emissions.**

**OTEC could overcompensate for global energy consumption**

**Holt**, retired member of the Institute of Physics, **7** (Dr. Chris Holt, 9/1/07, “Energy from the Oceans,” Physics Education Volume 42 Number 5, https://www.iop.org/activity/groups/subject/env/prize/file\_40766.pdf) LR

**The oceans are the world’s largest solar energy collector**. Every day, 60 million square kilometres of tropical seas absorb one quadrillion megajoules of solar energy, equivalent to 170 billion barrels of oil. **This solar energy is more than 1000 times greater than the current total global energy consumption. The oceans are a vast renewable resource. If this energy could be tapped, not only would it provide huge amounts of electrical power, but it would also reduce the amount of fossil fuel which is burnt, and so help mitigate the disastrous effects of climate change.** Ocean thermal energy conversion, or **OTEC, provides a way of harnessing this power**. In tropical and sub-tropical regions, the upper surface water is warmed by the sun and mixed to a depth of about 50 or 100 metres by wave motion. Deeper in the ocean, beyond about 500 to 1000 metres, the water has flowed from the polar regions and is very cold. Given a heat source and a heat sink, **it becomes possible to drive a heat engine**. In the closed-cycle version, warm water from the ocean surface is passed through a heat exchanger where it is used to evaporate a low-boiling point fluid, such as liquid ammonia. The expansion of the ammonia then drives a turbine to generate electricity. Cold, deep seawater is then pumped to the surface and used to cool and condense. In the open-cycle version, the warm surface water is introduced into a low-pressure container where it boils and the steam is used to drive a turbine to generate electricity. The steam is then condensed by exposing it to the cold deep seawater. There is also a hybrid system, where the warm seawater is vaporised under vacuum, and the steam which is produced is used to vaporise the low-boiling-point fluid to drive a turbine.

#### Power generation costs are as much as wind while being far more consistent.

**Burns ’11**(Stuart 4/25 “OTEC’s Zero-Carbon Emissions Too Good to Be True? Maybe not”http://agmetalminer.com/2011/04/25/unlimited-power-and-zero-carbon-emissions-too-good-to-be-true-maybe-not/)

In response to a recent article of ours entitled “Is there an Alternative to Nuclear for Asia,” a reader left a comment regarding a technology that appears to have been on the cusp of commercial realization for nearly two decades, but has been largely ignored in preference to simpler wind and solar technologies. We’re talking about Ocean Thermal Energy Conversion (OTEC), and we rather liked the idea for a number of reasons. First and foremost, large-scale rollout would involve substantial opportunities for metals in the same way offshore oil and gas exploration have done for nickel- and chrome-based stainless and super alloys. Compared to electricity-generating technologies like wind and solar that are subject to the weather and day/night cycles, OTEC would operate 24 hours a day, seven days a week, 365 days a year with the only likely interruption being due to hurricanes when, like oil rigs, operations can be temporarily shut down. One of the greatest attractions is the economic case made not just on power generation but a host of other potential quantifiable benefits like desalinated water, aquaculture and, depending on the plant location, even air-conditioning for shore-based installations. OK, enough of the hype — how does it work?¶ Broadly, the technology takes advantage of the temperature difference between warm tropical waters at the surface and cold waters at depth to drive a turbine and generate electricity. In waters between the Tropics of Capricorn and Cancer there are multiple sites around the world where surface temperatures are up to 24-28 degrees Celsius and the sea bed drops down to up to 4,000 feet with temperatures down to 5-6 degrees C.¶ The above diagram from www.our-energy.com illustrates the comparatively simple process called the Rankine Cycle – the basic principals have been known for a hundred years or more. Water condensed after the turbine stage can be collected as desalinated water, a resource often in short supply in tropical regions. In addition to electricity and clean water, there is the potential for a proportion of the nutrient-rich cool waters to be diverted to shore-based pools if plants are built on land or close to land. These waters can be used for farming salmon, abalone, oysters, clams and lobster, premium products that can generate additional revenues if carried out on a commercial scale.¶ Undoubtedly, for OTEC to be viable as a power source (as Wikipedia points out), the technology must have tax and subsidy treatment similar to competing energy sources. Because OTEC systems have not yet been widely deployed, cost estimates are uncertain. One study estimates power generation costs as **low as US $0.07 per kilowatt-hour, compared with $0.05 – $0.07 for subsidized wind systems**, so for power costs it’s in touch. If other benefits such as desalinated water can be brought into play the viability may be improved further. In one study by a leading technology developer, Sea Solar Power, the fresh water alone could be worth up to two-thirds of the value of the electricity. Lockheed Martin has been running a pilot project in Hawaii that should be generating 10 MW by 2012/3 and all being well, a 100 MW site by 2015. Hawaii was spending $8 billion/year on imported fossil fuels in 2009 (more now with current prices), all of which could be replaced by OTEC with zero carbon emissions.¶ Major hurdles still need to be overcome, one of which is the cost and design of the deep water pipe used to bring cold water to the surface. One suggestion is to pump the refrigerant down to the depths and then bring it back up chilled. But that would lose the benefit of using nutrient-rich deep water for aquaculture; however, for plants sited further out to sea that opportunity is greatly diminished anyway. It may be that it takes Lockheed Martin’s largely government-funded research project to prove the technology, yet for the last 40 years Sea Solar’s founders have been researching and developing the technology largely off their own backs. (How often has the original inventor not been the one to capitalize on the development of a new technology?) Nevertheless as Lockheed’s video introduces, the world’s oceans absorb the equivalent of 250 billion barrels of oil-equivalent solar energy every day; if less than 0.1 percent of this could be harnessed via OTEC, it would be the equivalent of 20 times the electricity consumed in the US with virtually zero carbon emitted, no unsightly windmills in your backyard or desert tortoises inconvenienced. A prize worth spending some federal dollars on if ever there was one!

**OTEC presents sustainable clean energy as a start to combatting climate change**

**Michaelis 8** (Dominic Michaelis, is an architect and engineer, developing the energy island concept with Trevor Cooper-Chadwick of Southampton University, “Could sea power solve the energy crisis?,” Renewable Energy from the Sea, 1/20/08, http://www.marinet.org.uk/campaign-article/could-sea-power-solve-the-energy-crisis)

It may sound like science fiction, but Ocean Thermal Energy Conversion (**OTEC) is an idea whose time has come**. It is based on the work of Jacques-Arsène d’Arsonval, a 19th-century French physicist who thought of using the sea as a giant solar-energy collector.

The theory is very simple: **OTEC extracts energy from the difference in temperature between the surface of the sea** (up to 29C in the tropics) **and the waters a kilometre down**, which are typically a chilly 5C. **This powers a “heat engine”: think of a refrigerator in reverse, in which a temperature difference creates electricity.** Claude’s efforts to develop a practical version of d’Arsonval’s concept had to be abandoned due to poor weather and a lack of funds. **But a modern equivalent would meet much of the world’s energy needs, without generating polluting clouds of carbon and sulphur dioxide.** It could also produce vast quantities of desalinated water to be shipped to parched areas of the world such as Africa. How ocean power operates **There are two basic versions of the technology. The first operates in a “closed cycle”, using warm surface water to heat ammonia**, which boils at a low temperature. **This expands into vapour, driving a turbine that produces electricity. Cold water from the depths is used to cool the ammonia, returning it to its liquid state so the process can start again. The “open cycle” version offers the added benefit of producing drinking water as a by-product.** Warm seawater is introduced into a vacuum chamber, in which it will boil more easily, leaving behind salt and generating steam to turn a turbine. Once it has left the turbine, the steam enters a condensing chamber cooled by water from the depths, in which large quantities of desalinated water are produced – 1.2 million litres for every megawatt of energy. A 250MW plant (a sixth of the capacity of the new coal-fired power station that has just won planning permission in Kent) could produce 300 million litres of drinking water a day, enough to fill a supertanker. Using electrolysis, it would also be possible to produce hydrogen fuel.

#### OTEC could significantly impact global warming

**Baird 13** (Jim Baird, Owner and Partner of the Global Warming Mitigation Method, “OTEC Can Be a Big Global Climate Influence,” The Energy Collective, 8/3/13, http://theenergycollective.com/jim-baird/267576/otec-can-be-big-global-climate-influence)

**OTEC uses the temperature difference between cooler deep and warmer surface ocean waters to run a heat engine and produce useful work, usually in the form of electricity.**

**It too can have a big influence on global climate because it converts part of the accumulating ocean heat to work and about twenty times more heat is moved to the depths in a similar fashion to how Trenberth suggests the global-warming hiatus has come about.**

**The more energy produced by OTEC – done properly the potential is 30 terawatts - the more the entire ocean will be cooled and that heat converted to work will not return as will be the case when the oceans stop soaking up global-warming’s excess.** Kevin Trenberth estimates the oceans will eat global warming for the next 20 years.Asked if the oceans will come to our climate rescue he said, “That’s a good question, and the answer is maybe partly yes, but maybe partly no.” The oceans can at times soak up a lot of heat. Some goes into the deep oceans where it can stay for centuries. But heat absorbed closer to the surface can easily flow back into the air. That happened in 1998, which made it one of the hottest years on record. Since then, the ocean has mostly been back in one of its soaking-up modes.“They probably can’t go for much longer than maybe 20 years, and what happens at the end of these hiatus periods, is suddenly there’s a big jump [in temperature] up to a whole new level and you never go back to that previous level again,” Trenberth says. **The bottom line is global-warming needs to be put on a permanent hiatus and the world needs more zero emissions energy. OTEC provides both.**

#### OTEC is a promising step towards clean energy

**Crews** financial specialist and writer **97** (Richard Crews, 12/28/97 “OTEC Sites,” http://www.trellis.demon.co.uk/reports/otec\_sites.html)

**Ocean thermal energy conversion (OTEC) is perhaps the most exciting world energy resource for the future-the near future. It promises vast amounts of energy** (even ten times the current worldwide human utilization) **that is cheap** (competitive with $25-per-barrel crude oil), **naturally self-renewing, and ecologically friendly.** As a beneficial side effect, OTEC can turn vast stretches of starved "ocean deserts" into lush "ocean oases" teeming with sea life. OTECs can be sited anywhere across about 60 million square kilometers (23 million square miles) of tropical oceans-anywhere there is deep (and, therefore, cold) water lying under warm surface water. This generally means at latitudes within about 20 or 25 degrees of the equator-very roughly between the Tropic of Cancer and the Tropic of Capricorn. (For meteorological reasons this zone is somewhat contracted along the west coasts of continents and expanded along the east coasts.) Surface water in these regions, warmed by the sun, generally stays at 25 degrees Celsius (77 degrees Fahrenheit) or above. Ocean water more than 1,000 meters (0.6 miles) below the surface is generally at about four degrees C (39 degrees F). Since the average ocean depth is about 4,000 meters (2.5 miles), there is a vast reservoir of cold deep water under tropical skies-some 180 million cubic kilometers (43 million cubic miles). And even this inconceivably vast resource is constantly being renewed by deep cold-water flows from the polar regions. The warmth of the surface water is constantly renewed by the heat of the Sun. The tropical ocean surface functions as an efficient solar collector. Over 90 percent of the radiant energy that falls on it is absorbed and serves to warm the water. The vastness of this energy resource can be appreciated by the realization that the absorbed solar energy per day is equivalent to over 1,000 times the current worldwide human energy consumption. The OTEC process consists of pumping cold ocean water to the surface and using the temperature differential between this and warm surface water to run a thermal engine to generate electricity. This process, producing electrical energy from a temperature differential, is well known in physics and engineering. In fact, it is the reverse of the common refrigeration process (which produces a temperature differential using electrical energy). What are the benefits of OTEC? **The energy resources for OTEC are vast. The energy resources for OTEC are naturally self-renewing. OTEC is non-polluting, in fact, it is ecologically positive since it enriches nutrient-poor surface water and tends to “sink” carbon.** The **nitrogen, phosphorus, silica, and other nutrients raised from the deep are combined via photosynthesis with atomospheric and ocean-dissolved carbon dioxide to produce increased biomass and reduce atmospheric carbon load.** OTEC is based on established turbine and refrigeration technologies. OTEC readily produces, as side benefits, considerable quantities of fresh water, sea foods, and marine-life-based industrial products, as well as chill-water for air conditioning\* and cold-bed agriculture.\*\*

#### OTEC is the next step in mitigating climate change - reliable and sustainable

**Makai Ocean Engineering 8 (“OTEC – Ocean Thermal Energy Conversion,”** http://www.makai.com/otec-ocean-thermal-energy-conversion/**)**

Ocean Thermal Energy Conversion (OTEC) is a process that can produce electricity by using the temperature difference between deep cold ocean water and warm tropical surface waters. OTEC plants pump large quantities of deep cold seawater and surface seawater to run a power cycle and produce electricity. **OTEC is firm power (24/7), is a clean energy source, is environmentally sustainable and is capable of providing massive levels of energy.** A basic closed-cycle OTEC plant is shown in in the figure to the right. Warm seawater passes through an evaporator and vaporizes the working fluid, ammonia. The ammonia vapor passes through a turbine which turns a generator making electricity. The lower pressure vapor leaves the turbine and condenses in the condenser connected to a flow of deep cold seawater. The liquid ammonia leaves the condenser and is pumped to the evaporator to repeat the cycle. OTEC has long been challenged by high capital costs in a world of cheap energy. **Recently**, however, **higher electricity costs, increased concerns for global warming, and a political commitment to energy security have made initial OTEC commercialization economically attractive** in tropical island communities where a high percentage of electricity production is oil based. Even within the US, this island market is very large; globally it is many times larger. As OTEC technology matures, it should become economically attractive in southeast US. Benefits and Opportunities of OTEC **OTEC is in many ways a very attractive solution to US energy issues** (**Energy Security, Price Volatility, Unsustainable Supply, Climate Change, and Environmental Risks**): Immense Resource: OTEC is solar power, using the oceans as a thermal storage system for 24-hour production. Unlike other renewable energies, the maximum available energy from OTEC is not limited by land, shorelines, water, environmental impact, human impact, etc. Baseload Power: OTEC produces electricity continuously, 24 hours a day throughout the entire year. **Other renewable energy sources like wind, solar, and wave are not baseload and require storage of this energy during peak hours for later consumption**, which is one of the major hurdles for these technologies. Security: OTEC offers the opportunity of tapping an immense energy resource that is not controlled by other nations. Renewable: **OTEC is conservatively believed to be sustainable at four or more times man’s current total electrical energy production**. **Clean Energy: OTEC has the potential of being a very clean alternative energy – unique for a firm power source capable of providing massive energy needs. The environmental risk with OTEC is very low**. Offshore: OTEC production occurs offshore. Land resources are not needed other than for on-shore landing. OTEC is not competing for other vital resources such as food and fresh water. Low Risk: Conventional Closed Cycle OTEC is a low-risk.

**OTEC provides reliable, cheap, and clean energy**

**Lockheed Martin 13** (American global aerospace, defense, security and advanced technology company with worldwide interests, “OTEC is Reality, Not Science Fiction,” <http://www.lockheedmartin.com/us/news/features/2013/otec.html>, 10/13/13)

Imagine if the ocean, covering more than 70 percent of the Earth’s surface, could be a source of plentiful, clean energy. In 1870, Jules Verne introduced the concept of ocean thermal energy conversion (OTEC), using ocean temperature differences to create power, in the classic Twenty Thousand Leagues Under the Sea.¶ This is no longer a figment of someone’s imagination but an innovative answer to our customer’s call for new ways to create clean, baseload energy.¶ Lockheed Martin and Beijing-based Reignwood Group signed a contract Oct. 30 to begin design of a 10-megawatt OTEC power plant, the largest OTEC project to date.¶ This 10-megawatt plant is considered a crucial step toward the full commercialization of OTEC. Under this initial contract, Lockheed Martin will provide project management, design and systems engineering. Critical advances in our technologies allow **OTEC** to **serve as an economically viable energy source, available 24 hours a day, seven days a week**, rain or shine.¶ “The **ocean holds enormous potential for clean, baseload energy,”** said Dan Heller, vice president of new ventures for Lockheed Martin Mission Systems and Training. “**Capturing this energy through** a system like **OTEC means we have the opportunity to produce reliable and sustainable power, supporting global security, a strong economic future and climate protection for future generations.” ¶** In April, the two companies signed a memorandum of agreement for this project.¶ While in Beijing, Lockheed Martin also joined Reignwood Group in celebrating the ribbon cutting of Reignwood’s new Innovative Technology Center, located at their corporate Beijing headquarters. The Innovative Technology Center is designed after Lockheed Martin’s Energy Solutions Center in Arlington, Va., which showcases new ideas for alternative energy generation and energy infrastructure.¶ “This OTEC agreement and the establishment of a joint Innovative Technology Center between Reignwood Group and Lockheed Martin represents an important milestone that brings our advanced technologies to bear on the important global issues of climate change and renewable energy,” said Dr. Ray O. Johnson, senior vice president and chief technology officer for Lockheed Martin.¶ **OTEC uses the natural temperature differences found in the ocean of tropical regions to drive turbine generators that create electricity**. The **energy produced by an OTEC facility is clean, baseload, reliable, sustainable and well-suited to the ocean conditions found near 80 countries around the world,** including in the Asia-Pacific.

**OTEC’s self-sufficiency and clean energy has potential for combatting warming**

**Sherer 8** (Kyle, writer of scientific issues for Gizmag, an online news provider for new technology, innovations, and science; “Energy Island: unlocking the potential of the ocean as a renewable power source,” <http://www.gizmag.com/energy-island-otec/8714/>, 01/28/08)

January 29, 2008 While governments and corporations were exploring petroleum as a fuel source in the 19th century, Jacques Arsene d’Arsonval proposed another liquid source for power – the ocean. It may have taken a hundred years, but his ideas are finally starting to come into fruition. Ocean Thermal Energy Conversion uses the temperature difference between surface and deep-sea water to generate electricity – and though it has an efficiency of just 1-3% - **researchers believe an OTEC power plant could deliver up to 250MW of clean power, equivalent to one eighth of a large nuclear power plant, or one quarter of an average fossil fuel power plant.** Architect and engineer Dominic Michaelis and his son Alex, along with Trevor Cooper-Chadwick of Southampton University are developing the concept with plans of putting the theory to the test on an unprecedented scale by building a floating, hexagonal Energy Island that will harness energy from OTEC, as well as from winds, sea currents, waves, and the sun.¶ The Energy Island concept will target tropical waters¶ Energy Island: unlocking the potential of the ocean as a renewable power source¶ Energy Island: unlocking the potential of the ocean as a renewable power source¶ Energy Island: unlocking the potential of the ocean as a renewable power source¶ View all¶ The US National Renewal Energy Laboratory estimates that the **world’s tropical seas absorb the solar power equivalent of 250 billion barrels of oil per day. OTEC uses warm surface water to vaporize a fluid with a low boiling point**, typically ammonia or propane, **and pumps cooler water from depths** of up to 1000 meters **below the surface to re condense the fluid**. The **movement of the liquid through the system is enough to continually power a turbo-generator.** The simplistic nature of **the station**, which **behaves almost like a gigantic internal combustion engine, allows OTEC power plants to be largely self-sufficient**. And **unlike wind and solar energy, which have a fluctuating output that changes according to the weather and the time of day, the regularity of ocean temperatures and movements provide a far more stable and consistent source of power.¶** The Energy Island project is bidding for the US$25 million funding offered by Richard Branson’s Virgin Earth Prize, which is awarded for environmentally responsible research. The **OTEC technology is** something of a green dream; not only is it **clean and renewable,** but so are its by-products. By subjecting the steam to electrolysis, large quantities of hydrogen can be produced, paving the way for cheaper hydrogen fuel cells. And by using an Open-cycle OTEC - where low-pressure containers boil seawater and condense the steam elsewhere after passing it through the turbo-generator – large amounts of fresh water can be created. Energy Island is also packed to the brim with other renewable energy collectors, with wind, wave, current and solar sources providing a total of 73.75 MW.¶ Michaelis estimates **it would take a chain of 4-8 Energy Islands to achieve the production levels of a nuclear power plant. To replace nuclear power entirely,** Michaelis estimates **a chain of 3708 modules would be required**, stretched over a total length of 1928 kilometres, and consuming a total square area of roughly 30 by 30 kilometres**. To shoulder the entire global energy consumption**, based on 2000 figures**, 52 971 Energy Islands would be needed**, occupying a total area of 111 x 111 kilometres - described on the Energy Island site as “a pin point in the oceans.” Though the Islands have to be spread out to be effective, their location doesn’t infringe on otherwise usable real estate, as is the case with land power stations, and some bioethanol farms. Michaelis claims that in certain areas, **chains of Energy Islands** may even help **maintain the environment, by combating erosion from the predicted rising sea levels, supporting deep-water ecosystems and aquaculture, and cooling greenhouses.¶** Energy Island isn’t the first project to portray OTEC as the solution to Earth’s power and pollution woes. Previous plans for the technology, most notably John Craven’s, have been positively utopic. Craven saw OTEC not only as a source of cheap power and water, but also as a method for accelerating crop growth, and, (no utopia would be complete without it), a provider of free air conditioning. Project Windfall, meanwhile, was a plan authored by a Florida group that involved installing an OTEC plant in order to reduce the hurricanes that routinely ravage the east coast.¶ But while OTEC has captured the imagination of scientists, it has not had nearly so much success with governments. The United States established the Natural Energy Laboratory of Hawaii Authority in 1974, viewing the high electricity costs of the state, and the dynamics of the surrounding water, as the ideal testing ground for OTEC technology. The NEL successfully demonstrated a 250 kW closed-cycle plant in 1999, but ultimately the money evaporated faster than the water, and Congress shifted attention to more economical areas of research. OTEC could be commercially viable, said test director Luis Vega, but it needed “patient funding” to reach that stage.¶ Only now, with rising oil prices and the increasingly cataclysmic predictions of global warming, could OTEC receive the “patient funding” necessary for progress. Plans for OTEC plants are being entertained by the governments of Japan, Taiwan, India, South Africa, the Philippines and the US, which recently passed a bill that gives OTEC, and tidal, wave, and ocean current research, $50 million per year for five years.¶ However, the next breakthrough in OTEC research may well come from the armed forces. The US government has been directing its various departments into funding and using renewable energy – in an example that must give Democrats migraines of confusion, Guantanamo Bay receives a quarter of its power from wind energy. By 2025, the Pentagon is to increase its renewable energy use to 25% of its total power. The Navy is planning to build an 8MW OTEC facility in 2009, near the island of Diego Garcia in the Indian Ocean, while the Army is planning to build an OTEC facility in the Marshall Islands in the Pacific.¶ As the Energy Island site states, despite being 100 years old, OTEC is in its infancy. But given the renewed interest, and the multitude of various benefits, it’s possible that the next 100 years of this concept could profoundly change the energy and environmental management of the Earth.

**OTEC provides up to 100x greater energy than other ocean energy options**

**Science Penguin 14** (blog on past and contemporary science, “Ocean thermal energy conversion,” Science Penguin, <http://sciencepenguin.com/ocean-thermal-energy-conversion/>, 03/14)

**Ocean thermal energy conversion (OTEC) uses the temperature difference between cooler deep and warmer shallow or surface ocean waters to run a heat engine and produce useful work, usually in the form of electricity. OTEC is a base load electricity generation system, i.e. 24hrs/day all year long.** However, the temperature differential is small and this impacts the economic feasibility of ocean thermal energy for electricity generation.¶ Systems may be either closed-cycle or open-cycle. Closed-cycle engines use working fluids that are typically thought of as refrigerants such as ammonia or R-134a. These fluids have low boiling points, and are therefore suitable for powering the system’s generator to generate electricity. The most commonly used heat cycle for OTEC to date is the Rankine cycle using a low-pressure turbine. Open-cycle engines use vapour from the seawateritself as the working fluid.¶ OTEC can also supply quantities of cold water as a by-product. This can be used for air conditioning and refrigeration and the nutrient-rich deep ocean water can feed biological technologies. Another by-product is fresh waterdistilled from the sea.¶ OTEC theory was first developed in the 1880s and the first bench size demonstration model was constructed in 1926. Currently the world’s only operating OTEC plant is in Japan, overseen by Saga University.¶ Thermodynamic Effiecency¶ **A heat engine gives greater efficiency when run with a large temperature difference.** In the oceans the temperature difference between surface and deep water is greatest in the tropics, although still a modest 20 to 25 °C. It is therefore in the tropics that OTEC offers the greatest possibilities**. OTEC has the potential to offer global amounts of energy that are 10 to 100 times greater than other ocean energy options such as wave power.** **OTEC plants can operate continuously providing a base load supply for an electrical power generation system.**¶ The main technical challenge of OTEC is to generate significant amounts of power efficiently from small temperature differences. It is still considered an emerging technology. Early OTEC systems were 1 to 3 percent thermally efficient, well below the theoretical maximum 6 and 7 percent for this temperature difference. Modern designs allow performance approaching the theoretical maximum Carnot efficiency and the largest built in 1999 by the USA generated 250 kW.¶ Cylce Types¶ Cold seawater is an integral part of each of the three types of OTEC systems: closed-cycle, open-cycle, and hybrid. To operate, the cold seawater must be brought to the surface. The primary approaches are active pumping and desalination. Desalinating seawater near the sea floor lowers its density, which causes it to rise to the surface.¶ The alternative to costly pipes to bring condensing cold water to the surface is to pump vaporized low boiling point fluid into the depths to be condensed, thus reducing pumping volumes and reducing technical and environmental problems and lowering costs.¶ CLOSED, OPEN, HYBRID, WORKING FLUIDS¶ Some Proposed Projects¶ OTEC projects under consideration include a small plant for the U.S. Navy base on the British overseas territory island of Diego Garcia in the Indian Ocean. Ocean Thermal Energy Corporation (formerly OCEES International, Inc.) is working with the U.S. Navy on a design for a proposed 13-MW OTEC plant, to replace the current diesel generators. The OTEC plant would also provide 1.25 million gallons[clarification needed] per day of potable water. This project is currently waiting for changes in US military contract policies. OTE has proposed building a 10-MW OTEC plant onGuam.¶ Hawaii, Hainan, Japan¶ Politicial Concerns¶ Because OTEC facilities are more-or-less stationary surface platforms, their exact location and legal status may be affected by the United Nations Convention on the Law of the Sea treaty (UNCLOS). This treaty grants coastal nations 3-, 12-, and 200-mile (320 km) zones of varying legal authority from land, creating potential conflicts and regulatory barriers. OTEC plants and similar structures would be considered artificial islands under the treaty, giving them no independent legal status. OTEC plants could be perceived as either a threat or potential partner to fisheries or to seabed mining operations controlled by the International Seabed Authority.

## Solvency

### Solvency: 1AC

#### Thus the plan: The United States federal government should substantially increase its investment in the development and deployment of offshore Ocean Thermal Energy Conversion technology.

#### Federal investment is key to jumpstart the industry

HCP No Date

“NOAA Officials’ Visit Hints At Stepped Up Effort On OTEC Development” http://www.hawaiicleanpower.com/noaa-officials’-visit-hints-at-stepped-up-effort-on-otec-development/

Kehoe said in opening remarks that NOAA believes the serious efforts underway by industry to bring OTEC to commercialization deserve a serious response by NOAA. Noting that the U.S. Navy is moving ahead aggressively with OTEC, he said “the last thing NOAA wants is to be behind everybody else.” He said a regulatory gap exists for OTEC and that a “demonstration plant” isn’t even defined in existing regulations. NOAA would have a predicament if an OTEC demonstration plant applied for licensing. Kehoe said as many as 10 federal agencies have a role in authorizing the first OTEC demonstration plant. “When people in these agencies hear about this technology, they tend to be shell-shocked,” Kehoe said, explaining that OTEC issues are arriving on desks that already are piled high with other work. “OTEC is on a scale so much larger than anything we’ve dealt with before,” he said. Others noted that a large OTEC plant will require the vertical movement of huge rivers of water – a realization that contributes to the shock. A Coast Guard representative said public buy-in will be critical to achieving OTEC commercialization. He said “the public relations people have a job cut out for them” because of the anticipated high cost of OTEC commercialization and public perceptions of potential environmental impact. But others said they believe Hawaii residents have a good understanding about the need to reduce the state’s debilitating dependence on oil for 90 percent of its energy. Some participants said so much data has been accumulated about potential OTEC plant sites in Hawaiian waters that writing an acceptable environmental Impact statement isn’t as daunting as it might appear. A pilot plant could be built using that wealth of information, they said, and future commercial plants would use lessons learned from that first small starter plant. Kehoe said the recent meeting at the University of New Hampshire (linked above) on the readiness of commercial scale development concluded that “no existing paradigm to fund OTEC will work.” He said the same amount of brainpower is required in the room to work on the financial side as exists on the technical side. Kehoe also suggested that initial OTEC plants won’t be built with federal funding because of the high risk, but others noted thatthe federal government hadfunded the country’s first nuclear power plant, andthe same may be needed to launch the OTEC technology.It wouldn’t be unreasonable, they said, for the federal government to fund the 10-MW demonstration plant.

#### Federal action is key—only the federal government has the jurisdiction to deploy OTEC offshore

Elefant No Date - Carolyn Elefant, CEO and legislative director of the Ocean Renewable Energy Coalition, no date, “Regulation of Offshore Renewables Development -Existing Regulatory Regime and Proposals for Improvement,” <http://www.his.com/~israel/loce/naspresent.pdf>

OTEC Act, 42 U.S.C. § 9111 - gives NOAA jurisdiction to license OTEC projects: No person shall engage in the ownership, construction or operation of an OTEC facility...[located in waters of the United States] except with a license issued by NOAA. A) OTEC Act was intended to create one stop shopping for licensing of OTEC plants. NOAA promulgated regulations governing applications for OTEC licenses (15 C.F.R. Part 981) but withdrew them in 1996 due to lack of OTEC applicants. B) To obtain an OTEC license, applicants must comply with applicable federal and state laws (See Summary Chart for more details). For example, OTEC applicant will need to get a Section 10 permit from Corps of Engineers because plant may pose an obstruction to navigation. But NOAA regulations provide for Consolidated Application Review (CAR) to coordinate timing and processing of multiple permit applications. C) OTEC regulations allow exemption for demo projects qualified by Department of Energy and non-permanent test platforms D) Standard for issuance of license: project is in national interest and complies with applicable laws.

#### U.S. development key—technological expertise

Moore 06 - Bill Moore, discussion with Dr. Hans Jurgen Krock, the founder of OCEES on the revival of Ocean Thermal Energy Conversion. April 12, 2006 http://www.evworld.com/article.cfm?storyid=1008

"The United States is the best placed of any country in the world to do this," he contends. "The United States is the only country in the world of any size whose budget for its navy is bigger than the budget for its army." It's his contention that this will enable America to assume a leadership position in OTEC technology, allowing it to deploy plants in the Atlantic, Caribbean and Pacific, but he offers a warming."If we are stupid enough not to take advantage of this, well then this will be China's century and not the American century.” Krock is currently negotiating with the U.S. Navy to deploy first working OTEC plant offshore of a British-controlled island in the Indian Ocean -- most likely Diego Garcia though he wouldn't confirm this for security purposes. He is also working with firms in Britain and Netherlands and will be headed to China for talks with the government in Beijing. "The Chinese know very well that they cannot build there futures on oil," he stated, noting that China's is investing large sums of money in a blue water navy. "The United States will be playing catch-up in this technology. We're here. We're willing to do it. We're doing it with the Navy." He expects to put his first plant to sea sometime in 2008 after constructing it, mostly likely, in Singapore.

#### Development of OTEC is technologically feasible—other ocean technologies provide a basis for development

Pelc and Fujita11/02

(Robin Pelc and Rod M. Fujita “Marine Policy” Volume 26 Issue 6 http://www.sciencedirect.com/science/article/pii/S0308597X02000453)

Renewable energy research has mostly focused on the development of solar, wind, biomass and geothermal sources. While these sources are all very promising, the best and most robust energy policy will take advantage of a full suite of renewable energy sources. With this in mind, we anticipate that governments, corporations, engineers, and scientists will increasingly look to the massive amounts of energy stored in the ocean. While ocean energy development necessarily presents some challenges, much of the infrastructure and knowledge necessary to generate energy from the ocean already exists, due in part to the offshore oil industry. Research suggests that overcoming technological challenges of ocean energy should not be prohibitive [5]. Some applications of wave, offshore wind, and possibly tidal energy may already be economically feasible for limited sites, and as research continues, costs of ocean energy are likely to drop to competitive levels.

### Solvency: A2 “Biofouling”

**Chlorination is sufficient to preventing biofouling formation**

**Laboy et al. 10** (Laboy, Manuel

Offshore Infrastructure Associates; Ruiz, Orlando E.

University of Puerto Rico;

Mayagüez, José

Technical Consulting Group; “OCEAN THERMAL ENERGY CONVERSION: HEAT EXCHANGER EVALUATION AND

SELECTION,” http://www.offinf.com/Energy2010Final.pdf)

The initial OTEC R&D programs concluded that an acceptable value for the fouling factor for¶ both the evaporator and condenser must be less than 0.000088 m2 oC/W(2)(3). Multiple experiments and¶ test activities were conducted in Hawaii, the Gulf of Mexico and Puerto Rico to determine rates of¶ biofouling under typical OTEC conditions using a heat transfer monitor (HTM) originally developed¶ by the Carnegie-Mellon University (CMU) and later improved by ANL. Results showed that¶ biofouling would exceed unacceptable levels in the warm water system (fouling factor > 0.000088 m2¶ oC/W) after six weeks of operation without fouling control(2)(3). **To maintain the fouling factor below¶ the acceptable level, both physical and chemical methods were explored** including chlorination¶ (continuous and intermittent), brushing, smooth or abrasive balls, slurries, ultrasonic and ultraviolet.¶ **The method found to be the most practical and cost effective is intermittent chlorination**(2)(3)(4). Since¶ continues chlorination would require more parasitic power, intermittent chlorination was the preferred¶ choice for the majority of the tests. **It has been proven that injection of 70 parts per billion of chlorine¶ for one hour per day in the warm water system prevents biofouling formation effectively**. This¶ concentration is significantly less than the limits allowed by the Environmental Protection Agency on¶ the discharge of chlorine from coastal power plants and similar industries(2)(3). I**ntermittent ozonation**¶ should be at least as effective as chlorination, and **may be an alternative** for actual plants.¶ **In the case of the cold water system, there was no indication of biofouling formation** in all the tests¶ conducted at the above sites. This is consistent with the operational data from the NELHA open-cycle¶ OTEC test facility at Keahole Point in Hawaii, where no biofouling was ever found in the cold water¶ system during the project’s five-year operation(2).

**Tests prove OTEC is feasible – effective performance, material durability, and biofouling control**

**Avery and Berl 13** (William H. Avery, Walter G. Berl, William H. Avery is the coauthor (with Chih Wu) of Renewable Energy from the Oceans (Oxford University Press, 1994). He was director of ocean energy programs and assistant director for R&D at the Johns Hopkins University Applied Physics Laboratory. Walter G. Berl was a member of the principal staff at APL., “Solar Energy from the Tropical Oceans,” Issues in Science and Technology, <http://issues.org/14-2/avery-2/>, 11/27/13)

**Tests and demonstrations** at reasonable scale **validated the power cycle performanc**e; the **cold water pipe design, construction, and deployment**; the **OTEC plant ship’s ability to withstand l00-year storms** (storms of an intensity that occurs, on average, once in 100 years); the **durability of its materials; and methods for controlling biofouling** of the heat exchangers.¶ Successful at-sea tests of a complete OTEC system (Mini-OTEC), including a 2,200-foot cold water pipe, were conducted with private funding near Kailea-Kona, Hawaii, in 1979. The program employed a Navy scow as a platform and used off-the-shelf components supplied by industrial partners in the venture. In four months of operation, Mini-OTEC generated 50 kilowatts-electric of gross power, which confirmed the engineering predictions. It demonstrated total system feasibility at reduced scale and was the first demonstration of OTEC net power generation.¶ A heat-exchanger test vessel, **OTEC-1, was deployed with DOE funding in l980 and satisfactorily demonstrated projected heat-exchanger performance, water-ducting, and biofouling control at a 1-MWe scale**. These results provided the scientific justification for the planned next step-a 40-MWe pilot plant demonstration.

**Research shows biofouling and debris clogging don’t harm plant operation**

**Faizal and Ahmed 12** (Mohammed Faizal, M. Rafiuddin Ahmed; Division of Mechanical Engineering, The University of the South Pacific, Laucala Campus, Suva, Fiji; “Experimental studies on a closed cycle demonstration OTEC plant working on¶ small temperature difference,” <http://albertsk.files.wordpress.com/2014/01/faizalahmed-otec2013.pdf>, Article history:¶ Received 7 January 2012¶ Accepted 8 September 2012¶ Available online 24 October 2012)

A **lot of research work has been carried out on OTEC since its discovery in 1881**. The first ever OTEC plant that was successfully¶ commissioned was in Hawaii in 1979. A 50-kW closed cycle floating¶ demonstration plant was constructed offshore. Coldwater at a temperature of 4.4 C was drawn from a depth of 670 m. During¶ actual operation of the plant, **it was found that biofouling,** effects of¶ mixing the deep coldwater with thewarm surfacewater**, and debris¶ clogging did not have any negative effects on plant operation**. The¶ longest continuous operation was for 120 h [9]. A 100-kW OTEC¶ pilot plant was constructed on-land for demonstration purposes¶ in the republic of Nauru in October 1981 by Japan. The system¶ operated between the warm surface water and a coldwater source¶ of 5e8 C at a depth of 500e700 m, with a temperature difference¶ of 20 C [10]. The **tests done were load response characteristics,¶ turbine, and heat exchanger performance tests. The plant had¶ operated by two shifts with one spare shift, and a continuous¶ power generation record of 10 days was achieved**. The plant¶ produced 31.5 kW of OTEC net power during continuous operation¶ and was connected to the main power system [10].

### Solvency: A2 “Not Cost Competitive”

#### OTEC plants are cost-competitive

Takahashi 13

(Masayuki Mac Takahashi Department of Systems Sciences, The University of Tokyo, Komaba, Tokyo, Japan *Deep Ocean Water as Our Next Natural Resource* Chapter 3: OTEC Is Not A Dream” <http://www.terrapub.co.jp/e-library/dow/pdf/chap3.pdf>)

Compared with other power plants, OTEC plants are expensive to construct, but the fuel costs nothing. Other types of power plants have to pay the cost of fuel, which varies in general according to current prices. Figure 30 shows a projection of electricity and fuel costs for various types of generation in the year 2000 compared with 1977. The comparison is based on construction costs of $900 for nuclear power plants and $720 for thermal power plants per kilowatt of output, and three different models of OTEC: $1500 (in the case of the cheapest construction cost), $2000 (medium) and $2500 (the most expensive) (Figure 30). Each OTEC estimate includes the cost of delivery to land over a distance of 40 kilometers. Even supposing that the cost of coal remained the same, by 2000 the cost of OTEC-produced electricity would be lower than thermally produced power, as long as OTEC power plant construction costs could be reduced. Similarly, if the price of uranium, the fuel for nuclear power plants, rose by only 0.8 percent, OTEC-generated electricity would be cheaper. If coal went up by 1.4 percent or more per year, OTEC-generated electricity would become more economical by the year 2000 even with a power plant constructed in the medium cost range. In actual fact, the price of coal rises by more than 8 percent per year, which leaves no doubt that OTEC-generated electricity will soon beat it for economy. Similarly, if the price of uranium rises by more than 2.7 percent per year, OTEC-generated electricity from a medium- cost plant will be competitive. What is more, if the costs for environmental conservation and waste disposal are added to the production costs of coal, oil and nuclear power plants, a much higher figure is reached. At present, not enough thought is given to those factors.

**OTEC plants pay for themselves within 5 years**

**Verpoort 09**

B.J. Kleute, G. Dodoros, J. Verpoort, Y. Safi Harb, Dr. K. Hemmes Faculty of Technology, Policy and Management (TPM) at Delft University of Technology, the Netherlands http://repository.tudelft.nl/assets/uuid:27c5ddc1-d783-47e4-938b-e7d68bff1753/Paper\_-\_Design\_of\_an\_10MW\_OTEC\_Power\_Plant\_FINAL.pdf

**Cost and revenues estimation and analysis reveal potential for an attractive profit.** The cost for the realization of the 10 MW plant is estimated at 77 ± 30 million USD, including 5% of operational expenditure per year. Assuming these costs, **a gross profit of 7 to 15 million USD can be realized per year.** This profit emerges from production costs of around 0.203 USD/kWh and current energy prices of 0.37 USD/kWh. Additionally, based on the local prices, **selling the water would provide an extra 3 million USD per year. According to this estimation, the initial investment will be written-off in 5 years on average with a plus/minus of 2 years**. This means that **the plant will start realizing profit in less than a decade which significantly increases its business potential**. The dOmeTEC design can be the solution for an innovative and low cost 10MW OTEC Power Plant. Integrating the innovations as mentioned above will optimize the operating performance, resulting in a relative high system efficiency of 3.4% and with a gross power of 11.16 MW. Thereby, the significant reduction of the OTEC capital investment shows OTEC to be an economical viable and technical feasible solution.

### Solvency: A2 “Storms”

#### OTEC can survive tropical storms.

Avery and Berl 13(William H. Avery and Walter G. Berl 11/27 William H. Avery is the coauthor (with Chih Wu) of Renewable Energy from the Oceans (Oxford University Press, 1994). He was director of ocean energy programs and assistant director for R&D at the Johns Hopkins University Applied Physics Laboratory. Walter G. Berl was a member of the principal staff at APL.http://issues.org/14-2/avery-2/)

A history of success¶ OTEC’s potential for providing the United States with an alternative to imported oil was recognized in l974 after the Organization of Petroleum Exporting Countries imposed its oil embargo. Between l975 and l982, DOE spent approximately $260 million on OTEC R&D in a detailed analysis of OTEC technical feasibility. Foreign studies also contributed to our information about OTEC. The findings included:¶ Technical feasibility. Tests and demonstrations at reasonable scale validated the power cycle performance; the cold water pipe design, construction, and deployment; the OTEC plant ship’s ability to withstand l00-year storms (storms of an intensity that occurs, on average, once in 100 years); the durability of its materials; and methods for controlling biofouling of the heat exchangers.¶ Successful at-sea tests of a complete OTEC system (Mini-OTEC), including a 2,200-foot cold water pipe, were conducted with private funding near Kailea-Kona, Hawaii, in 1979. The program employed a Navy scow as a platform and used off-the-shelf components supplied by industrial partners in the venture. In four months of operation, Mini-OTEC generated 50 kilowatts-electric of gross power, which confirmed the engineering predictions. It demonstrated total system feasibility at reduced scale and was the first demonstration of OTEC net power generation.¶ A heat-exchanger test vessel, OTEC-1, was deployed with DOE funding in l980 and satisfactorily demonstrated projected heat-exchanger performance, water-ducting, and biofouling control at a 1-MWe scale. These results provided the scientific justification for the planned next step-a 40-MWe pilot plant demonstration.¶ Environmental effects. Effects of the environment on OTEC plant ship operations and effects of OTEC on ocean ecology were studied and analyzed. Hurricanes do not occur near the equator where OTEC plant ships will be deployed. Small-scale water-tunnel tests indicated that the pilot plant ship and cold water pipe can withstand equatorial 100-year-storm conditions with a good safety margin. A commercial 365-MWe OTEC ammonia plant ship would be about the size of a large oil tanker and would be less affected by waves and current than was the pilot plant.¶ OTEC uses large volumes of warm and cold water that pass through fish barriers to the heat exchangers and are mixed and discharged at the bottom of the ship. The discharged waters are denser than the surface ocean waters, so they descend to a depth of about 500 meters, there spreading laterally to form a disk where the density of the discharged plume matches that of the ambient ocean water. Diffusion of heat from this layer to the surface is negligible for one plant ship. But effects on the surface layer could become detectable and possibly significant if large numbers of plant ships were deployed close together, or if the cold nutrient-rich water discharged were deliberately mixed into the surface layer. This option could lead to a substantial increase in marine life, like to that occurring off Peru where upwelling brings nutrient-rich cold water to the surface.¶ Plant ship spacing would have to be chosen on the basis of an acceptable tradeoff between total power delivery and environmental impact. If one-tenth of one percent of the incident solar energy were converted to electricity, one square kilometer of ocean would generate 0.2 MWe of net electric power. Roughly 1,800 square kilometers could supply solar heat for continuous operation of a 365-MWe OTEC plant. This would mean an average spacing between ships of 45 kilometers, and the fuel produced would be equivalent to 14 times the total U.S. gasoline energy use in l996.

#### OTEC can survive a storm (and maybe even steer one)

Choi ’08. (Charles Q. 12/12 “The Energy Debates: Ocean Thermal Energy Conversion” <http://www.livescience.com/3155-energy-debates-ocean-thermal-energy-conversion.html>”

The Facts¶ Most of the planet is covered by the oceans, and they absorb a staggering amount of energy from the sun each day. Ocean thermal energy conversion, or OTEC, taps into this energy to produce electricity.¶ Ocean thermal energy conversion relies on the fact that water near the surface is heated by sunlight while seawater deep in the dark is much colder. OTEC plants use warm surface water to heat ammonia or some other fluid that boils at a low temperature. The resulting gas is used to drive turbines that produce electricity. The gas is then cooled by cold water pumped up from the ocean depths and the resulting fluid is recycled to help generate power.¶ As OTEC relies on temperature differences, it works best in the tropics, where the surface water is hottest. As long as the temperature of surface water and the deep water differs by roughly 36 degrees Fahrenheit (20 degrees Celsius), an OTEC system can generate significant amounts of power.¶ The idea for ocean thermal energy conversion was originally proposed in 1881 by French physicist Jacques-Arsene d'Arsonval. The first OTEC plant was later built in Cuba in 1930 and produced 22 kilowatts of power, enough to supply roughly two typical modern households. Although a handful of OTEC plants were created following the oil crisis of the 1970s, funding for them dwindled after the price of oil dropped, and none are now operating.¶ Still, rising fuel costs have revived interest in these devices. In September the U.S. Department of Energy awarded its first grant for OTEC in years.¶ Ocean thermal energy conversion requires a lot of money up front since the devices are massive undertakings, Penney explained. The pipes have to be wide or else the deep seawater rushes up too fast, heating up as it rubs against the sides — an intolerable consequence, since it needs to be cold. To get the cold water necessary, the pipes also have to extend down thousands of feet. ¶ Keeping the plants operating in the face of the corrosive saltwater environment and organic matter that inevitably clogs up the works could prove challenging also.¶ "And for all that investment, you don't know if two months after you deploy it whether a tropical storm will then wipe it out," Penney said. Still, "the oil industry clearly knows how to put structures in place in the ocean and drill down to 15,000 feet. The technology is there — it could just be very costly."¶ The environmental impact of OTEC remains murky. While nutrients in cold water from the deep could help aquaculture farms prosper, one question is whether they might also help unwanted life to grow as well. "And if you're pumping up billions of gallons from the depths, what might it change there?" Penney asked. "There's life down there too."¶ One startling question is whether OTEC could divert the course of storms. "If you change ocean surface temperatures by even a few tenths of a degree, you could steer a storm," Penney said.¶

## Offcase Answers

### States CP: Ans

#### The 1980 OTEC Act assigns responsibility to the Coast Guard and national programs- the states have no jurisdiction

U.S. FED NEWS, 4-27-07 , “DEPUTY ASSISTANT SECRETARY FOR OCEANS AND ATMOSPHERE KEENEY TESTIFIES BEFORE HOUSE NATURAL RESOURCES SUBCOMMITTEE ON FISHERIES, WILDLIFE AND OCEANS,” lexis, KAPUSTINA

Ocean Thermal Energy Conversion Act of 1980: In the late seventies, there was also a period of interest in alternative energy sources. One of those alternatives ? ocean thermal energy conversion (OTEC) ? is a process that uses the heat energy stored in the warm surface waters of the world's oceans to produce electricity or other energy-intensive products. The Ocean Thermal Energy Conversion Act of 1980 (OTEC Act), gave NOAA lead responsibility for licensing the construction, ownership, location and commercial operation of OTEC plants.The OTEC Act directed the administrator of NOAA to establish a stable legal regime to foster commercial development of OTEC. In addition, the OTEC Act directed the secretary of the department in which the U.S. Coast Guard is operating to promote safety of life and property at sea for OTEC operations, prevent pollution of the marine environment, clean up any discharged pollutants, and prevent or minimize any adverse impacts from the construction and operation of OTEC plants. In addition, the Act was designed to ensure that the thermal plume of an OTEC plantship does not unreasonably impinge on, and thus degrade, the thermal gradient used by any other OTEC plantship or facility, the territorial sea, or an area of national resource jurisdiction of any other nation. An exception would be made, however, if the Secretary of State had approved such an impingement after consultation with a nation. The OTEC Act also assigns responsibilities to the Secretary of State and the Secretary of Energy regarding OTEC plants.

### Phytoplankton DA: Ans

**OTEC does not harm the phytoplankton population**

**Kennedy 12** (Charles, writer for Oilprice.com a news source for oil and energy, “DoE Publishes Study on the Biological Impact of OTEC,” <http://oilprice.com/Latest-Energy-News/World-News/DoE-Publishes-Study-on-the-Biological-Impact-of-OTEC.html>, 12/03/12)

Ocean Thermal Energy Conversion (OTEC) is a new technology that could play an important part in the future of renewable energy sources. It takes advantage of the natural temperature gradient, between warm water at the surface and cold water at depth, which exists all around the world. Governments have been interested in the potential of OTEC technology as a cost effective means of generating clean, renewable electricity.¶ One of the major problems that stands in the way of the success of OTEC, is the unknown ecological impact of pumping vast amounts of nutrient-rich water from the depths of the ocean up to the surface. It has been estimated that a small OTEC plant of just 5MW capacity would have a daily flow of more than two million cubic metres of water; what a 2011 environmental report described as “an unprecedented environmental modification that must be rigorously evaluated.”¶ The **main concern is the potential for huge phytoplankton blooms as the nutrient-rich deep sea water mixes with the warm water near the surface.¶** The Department of Energy (**DoE)** **recently published a report on a study by Makai Ocean Engineering which found that the effects of a 100MW OTEC plant in the waters off the coast of O’ahu, Hawaii,** **would not have any significant impact on the population and reproduction of phytoplankton.¶** The report stated that **Makai, a veteran of more than 30 years in the field of OTEC research, created situations to simulate the “biochemical effects of** the nutrient-enhanced seawater plumes that are discharged by one or several 100 megawatt (MW) **OTEC plants.”**¶ Makai created a model which consisted of “four separate ducts discharging a total combined flow rate of 420 cubic meters/second of warm water and 320 m3/s of cold water in a mixed discharge.”¶ Makai explained in its results that, “**as the nitrate is advected and dispersed downstream, only a fraction of the deep ocean nutrients** (< 0.5 umol/kg perturbation) **mix upward where they are utilized by the ambient phytoplankton population.”**

# \*\*OTEC Negative\*\*

## Adv: Aquaculture

### Aquaculture: 1NC

**\*\*note: see aquaculture neg for additional answers\*\***

**Food security improving now**

**Financial Times, 5/28** (“Boost for global food security,” 5/28/2014, <http://blogs.ft.com/the-world/2014/05/boost-for-global-food-security/>, JMP)

**Some good news for a change. Food security - the availability and affordability of food – has got better**, according to research published on Wednesday.

**The** 66-page **report from the Economist Intelligence Unit**, sponsored by DuPont, the chemicals company, **found that despite last year’s freak weather patterns - drought in California, heatwaves in Australia and floods in Russia – food security improved in almost three-quarters of the world’s countries**.

Food security is a growing concern, given the expectation that the world’s population is likely to peak at 10bn mid-century, meaning an extra 3bn mouths to feed.

**The biggest improvements were in countries with the worst food security problems, namely sub-Saharan Africa**, where only two – South Africa and Botswana – have a global food security index of more than 50 per cent.

**This has led to a narrowing of the gap with the most food-secure countries – headed by the US** – where improvements were slower.

**Lower wheat and rice prices were behind the improvement, as was a better world economy.** The EIU report backs up the Food and Agriculture Organisation’s recent research showing a fall in the number of hungry people from 868m in 2010-12 to 842m – still 12 per cent of the global population.

**Food insecurity empirically doesn’t cause conflict**

**Salehyan 7** – Professor of Political Science at the University of North Texas. (Idean, 6-14 “The New Myth About Climate Change Corrupt, tyrannical governments—not changes in the Earth’s climate—will be to blame for the coming resource wars.” <http://www.foreignpolicy.com/articles/2007/08/13/the_new_myth_about_climate_change>)

First, aside from a few anecdotes, **there is little systematic empirical evidence that resource scarcity and changing environmental conditions lead to conflict**. In fact, several studies have shown that an abundance of natural resources is more likely to contribute to conflict. Moreover, **even as the planet has warmed, the number of civil wars and insurgencies has decreased dramatically. Data collected by researchers at Uppsala University and the International Peace Research Institute**, Oslo **shows a steep decline in the number of armed conflicts around the world**. Between 1989 and 2002, some 100 armed conflicts came to an end, including the wars in Mozambique, Nicaragua, and Cambodia. If global warming causes conflict, we should not be witnessing this downward trend. Furthermore, **if famine and drought led to the crisis in Darfur, why have scores of environmental catastrophes failed to set off armed conflict elsewhere?** For instance, the U.N. World Food Programme warns that **5 million people in Malawi have been experiencing chronic food shortages for several years. But** famine-wracked **Malawi has yet to experience a major civil war**. Similarly, **the Asian tsunami** in 2004 killed hundreds of thousands of people, generated millions of environmental refugees, and **led to severe shortages of shelter, food, clean water, and electricity. Yet the tsunami, one of the most extreme catastrophes in recent history, did not lead to an outbreak of resource wars**. Clearly then, **there is much more to armed conflict than resource scarcity and natural disasters.**

**Wars are mostly regional – won’t escalate internationally**

**Allouche 11** – fellow at the Institute of Development Studies at Brighton, UK (Jeremy, "The sustainability and resilience of global water and food systems: Political analysis of the interplay between security, resource scarcity, political systems and global trade" Food Policy, Volume 36, Supplement 1)

This article has provided an overview of the current and future challenges in terms of global food and water systems. The major focus of the argument has been on how **resource scarcity is a contested and subjective concept which cannot fully explain conflict, political instability or food insecurity**. The politics of inequality and allocation are much more important variables in explaining water and food insecurity. This is particularly true for conflicts. **Although resource scarcity has been linked to international wars, the current data shows that most conflict over water and food are much more local. But there again, although resource scarcity can be linked to malnutrition, hunger and water insecurity, in the majority of cases, water and food insecurity are rarely about competition over resources but rather reflect the politics of allocation** and inequality. In this respect, war and conflicts aggravate these insecurities not just on the short term but also on the long term. At the global level, food security has considerably improved and provides the means to address these insecurities. **Trade can certainly be seen as a way to address access for countries that are under severe stress in terms of food and water and provides logical grounds for questioning the various water and food wars scenarios**. Although global trade and technological innovation are key drivers in providing stable and resilient global systems, the most destabilizing global water-related threat is increasing food prices and hunger. Overall, decision-makers should show greater concern for the human beings who make their living in agriculture, so that those at risk of livelihood and food-security failures, especially under anticipated scenarios of climate change, will be less deprived. Current debates linked to global food security and climate fail to address the political dimension of resource scarcity which is primarily linked to the politics of inequality, gender and power.

**Offshore aquaculture stymied by a number of factors**

**Klinger & Naylor, 12** --- \*Ph.D. student in Stanford's Emmett Interdisciplinary Program in Environmental and Resources, AND \*\*professor of environmental Earth system science at Stanford (Dane & Rosamond, “Searching for Solutions in Aquaculture: Charting a Sustainable Course,” <http://woods.stanford.edu/sites/default/files/files/searching%20for%20solutions%20in%20aquaculture.pdf>, JMP)

Nonetheless, **offshore aquaculture systems also present significant social, economic, and ecological challenges**. Land-based aquaculture is typically located on private land, but **marine aquaculture is often located in public coastal waters, creating use conflicts and equity issues with other public and private users**, including the privatization of historical commons (129–131). The analyses of profitability of offshore aquaculture under present conditions are mixed (127, 132–135). **Offshore operations are capital intensive and have high production costs, which must be recouped in productivity or price increases if operations are to be economically viable** (120, 122, 126). **Investment is currently stymied by** regulatory and **operational uncertainties, including** permitting, **structural engineering, remote feeding tools, mortality retrieval systems, and communications and monitoring systems that allow operations to function offshore** (120, 121, 131).

**Economic decline doesn’t cause war --- recent statistical evidence proves**

**Drezner, 12** --- The Fletcher School of Law and Diplomacy at Tufts University (October 2012, Daniel W., “THE IRONY OF GLOBAL ECONOMIC GOVERNANCE: THE SYSTEM WORKED,”

[www.globaleconomicgovernance.org/wp-content/uploads/IR-Colloquium-MT12-Week-5\_The-Irony-of-Global-Economic-Governance.pdf](http://www.globaleconomicgovernance.org/wp-content/uploads/IR-Colloquium-MT12-Week-5_The-Irony-of-Global-Economic-Governance.pdf))

The final outcome addresses **a dog that hasn’t barked: the effect of the Great Recession on cross-border conflict and violence**. During the initial stages of the crisis, **multiple analysts asserted that the financial crisis would lead states to increase their use of force as a tool for staying in power**.37 Whether through greater internal repression, diversionary wars, arms races, or a ratcheting up of great power conflict, **there were genuine concerns that the global economic downturn would lead to an increase in conflict**. Violence in the Middle East, border disputes in the South China Sea, and even the disruptions of the Occupy movement fuel impressions of surge in global public disorder.

**The aggregate data suggests otherwise, however. The Institute for Economics and Peace has constructed a “Global Peace Index” annually since 2007. A key conclusion they draw from the 2012 report is that “The average level of peacefulness in 2012 is approximately the same as it was in 2007.”**38 **Interstate violence** in particular **has declined since the start of the financial crisis** – as have military expenditures in most sampled countries. **Other studies confirm that the Great Recession has not triggered any increase in violent conflict**; the secular decline in violence that started with the end of the Cold War has not been reversed.39 Rogers **Brubaker concludes, “the crisis has not to date generated the surge in protectionist nationalism or ethnic exclusion** that might have been expected.”40

None of these data suggest that the global economy is operating swimmingly. Growth remains unbalanced and fragile, and has clearly slowed in 2012. Transnational capital flows remain depressed compared to pre-crisis levels, primarily due to a drying up of cross-border interbank lending in Europe. Currency volatility remains an ongoing concern. Compared to the aftermath of other postwar recessions, growth in output, investment, and employment in the developed world have all lagged behind. But the Great Recession is not like other postwar recessions in either scope or kind; expecting a standard “V”-shaped recovery was unreasonable. **One financial analyst characterized the post-2008 global economy as in a state of “contained depression.”**41 The key word is “contained,” however. **Given the severity, reach and depth of the 2008 financial crisis, the proper comparison is with Great Depression. And by that standard, the outcome variables look impressive.** As Carmen Reinhart and Kenneth Rogoff concluded in This Time is Different: “that its macroeconomic outcome has been only the most severe global recession since World War II – and not even worse – must be regarded as fortunate.”42

**The U.S. and global economy are resilient – new macroeconomic policies absorb shocks**

**Behravesh, 6** (Nariman, most accurate economist tracked by USA Today and chief global economist and executive vice president for Global Insight, Newsweek, “The Great Shock Absorber; Good macroeconomic policies and improved microeconomic flexibility have strengthened the global economy's 'immune system.'” 10-15-2006, [www.newsweek.com/id/47483](http://www.newsweek.com/id/47483))

The U.S. and global economies were able to withstand three body blows in 2005--one of the worst tsunamis on record (which struck at the very end of 2004), one of the worst hurricanes on record and the highest energy prices after Hurricane Katrina--**without missing a beat.** This resilience was especially remarkable in the case of the United States, which since 2000 has been able to shrug off the biggest stock-market drop since the 1930s, a major terrorist attack, corporate scandals and war.

Does this mean that recessions are a relic of the past? No, but recent events do suggest that the global economy's "immune system" is now strong enough to absorb shocks that 25 years ago would probably have triggered a downturn. In fact, over the past two decades, recessions have not disappeared, but have become considerably milder in many parts of the world. What explains this enhanced recession resistance? The answer: a combination of good macroeconomic policies and improved microeconomic flexibility.

Since the mid-1980s, central banks worldwide have had great success in taming inflation. This has meant that long-term interest rates are at levels not seen in more than 40 years. A low-inflation and low-interest-rate environment is especially conducive to sustained, robust growth. Moreover, central bankers have avoided some of the policy mistakes of the earlier oil shocks (in the mid-1970s and early 1980s), during which they typically did too much too late, and exacerbated the ensuing recessions. Even more important, in recent years the Fed has been particularly adept at crisis management, aggressively cutting interest rates in response to stock-market crashes, terrorist attacks and weakness in the economy.

The benign inflationary picture has also benefited from increasing competitive pressures, both worldwide (thanks to globalization and the rise of Asia as a manufacturing juggernaut) and domestically (thanks to technology and deregulation). Since the late 1970s, the United States, the United Kingdom and a handful of other countries have been especially aggressive in deregulating their financial and industrial sectors. This has greatly increased the flexibility of their economies and reduced their vulnerability to inflationary shocks. Looking ahead, what all this means is that a global or U.S. recession will likely be avoided in 2006, and probably in 2007 as well. Whether the current expansion will be able to break the record set in the 1990s for longevity will depend on the ability of central banks to keep the inflation dragon at bay and to avoid policy mistakes. The prospects look good. Inflation is likely to remain a low-level threat for some time, and Ben Bernanke, the incoming chairman of the Federal Reserve Board, spent much of his academic career studying the past mistakes of the Fed and has vowed not to repeat them.

At the same time, no single shock will likely be big enough to derail the expansion. What if oil prices rise to $80 or $90 a barrel? Most estimates suggest that growth would be cut by about 1 percent--not good, but no recession. What if U.S. house prices fall by 5 percent in 2006 (an extreme assumption, given that house prices haven't fallen nationally in any given year during the past four decades)? Economic growth would slow by about 0.5 percent to 1 percent. What about another terrorist attack? Here the scenarios can be pretty scary, but an attack on the order of 9/11 or the Madrid or London bombings would probably have an even smaller impact on overall GDP growth.

So what would it take to trigger a recession in the U.S. or world economies over the next couple of years? Two or more big shocks occurring more or less simultaneously. Global Insight recently ran a scenario showing that a world recession could happen if the following combination of events were to take place: oil prices above $100 per barrel, inflation and interest rates running 3 percentage points above current levels and a 10 percent drop in home prices across many industrial nations (e.g., the United States, the United Kingdom, Spain, Australia, Sweden). The likely timing of such a recession would be 2007. However, given the extremeness of these assumptions, the probability of such a scenario is less than 20 percent.

The good news is that the chances of a recession occurring in the next couple of years are low. The not-so-good news is that assertions about recessions being relegated to history's trash heap are still premature.

**Seafood trade deficit doesn’t undermine the economy**

**Kite-Powell, 11** --- aquaculture policy specialist at Woods Hole Oceanographic Institution (9/21/2011, Hauke, interview by Kate Madin, “Where Will We Get Our Seafood? Unlike the rest of the world, the U.S. has not embraced aquaculture,” http://www.whoi.edu/oceanus/feature/where-will-we-get-our-seafood, JMP)

What conclusions did you reach about the U.S. seafood trade deficit?

Kite-Powell: Two key facts were highlighted in the colloquium discussions. First, **the U.S. seafood trade deficit is** important to the seafood industry, but it's **not a big contributor to our national trade picture—it's swamped by our trade in petroleum and manufactured goods. So eliminating the seafood trade deficit is not going to make a noticeable dent in our nation’s overall trade situation.**

And second, **trade in seafood is not necessarily a bad thing. If there are other countries that can produce high-quality seafood much more efficiently than we can, it makes sense for us to buy it from them**. There are species that we may not want to grow in large quantities in the U.S.—possibly shrimp, which comprises a big chunk of our seafood trade deficit. Shrimp are farmed most efficiently in coastal ponds, and we don't have a lot of spare coastal real estate for ponds in the U.S. So it may not make sense to try to become self-sufficient in shrimp.

### Aquaculture: Ext—Food Security Improving

**Food security improving now**

**Dupont, 5/28** (“Global Food Security Index Improves,” 5/28/2014, <http://nationalhogfarmer.com/environment/global-food-security-index-improves>, JMP)

The question of global food security is significant, but a new report from the Economist Intelligence Unit (EIU) sponsored by DuPont offers improving grades on an important report card. **The 2014 Global Food Security Index shows that 70 percent of countries in the study saw food security scores rise over the previous year.**

**This index, which measures 28 different food security indicators, looks at the issue for 109 countries**. Craig F. **Binetti, president, DuPont Nutrition and Health, comments: "The index provides a common set of metrics that enable us to track progress in food security globally, and the outcomes thus far are promising.** But we know it will take continued collaboration, innovation and investment in agriculture, food and nutrition to overcome the vast challenges to feeding the world's growing population."

With the prospect of feeding 9 billion people by 2050, food security is a global issue. Food prices are a key factor impacting security, with many in the developing world already spend half to three-quarters of their income on food. Rising worries over water availability and access to arable land, add to the food security challenge.

**The index showed that every region improved from the prior year**, but most progress was seen in Sub-Saharan Africa, driven primarily by improved political stability and economic growth, despite the food-insecure-environment. The index slid for Central and South America and Asia Pacific as diet diversification fell and there was a decline in public spending on agricultural research.

In developing countries, the index shows the key challenges include inadequate infrastructure, political risk and food price inflation. For developed countries, the challenges include adapting to urbanization and the continued rise of obesity.

### Aquaculture: Ext—No Food Impact

**Their neo-Malthusian claims are false – food scarcity doesn’t cause war**

**Allouche 11** – fellow at the Institute of Development Studies at Brighton, UK (Jeremy, "The sustainability and resilience of global water and food systems: Political analysis of the interplay between security, resource scarcity, political systems and global trade" Food Policy, Volume 36, Supplement 1)

The question of resource scarcity has led to many debates on whether scarcity (whether of food or water) will lead to conflict and war. The underlining reasoning behind most of these discourses over food and water wars comes from the Malthusian belief that there is an imbalance between the economic availability of natural resources and population growth since while food production grows linearly, population increases exponentially. Following this reasoning, **neo-Malthusians claim that finite natural resources place a strict limit on the growth of human population and aggregate consumption; if these limits are exceeded, social breakdown, conflict and wars result. Nonetheless, it seems that most empirical studies do not support any of these neo-Malthusian arguments**. Technological change and greater inputs of capital have dramatically increased labour productivity in agriculture. **More generally, the neo-Malthusian view has suffered because during the last two centuries humankind has breached many resource barriers that seemed unchallengeable**. Lessons from history: alarmist scenarios, resource wars and international relations In a so-called age of uncertainty, **a number of alarmist scenarios have linked the increasing use of water resources and food insecurity with wars.** The idea of water wars (perhaps more than food wars) is a dominant discourse in the media (see for example Smith, 2009), NGOs (International Alert, 2007) and within international organizations (UNEP, 2007). In 2007, UN Secretary General Ban Ki-moon declared that ‘water scarcity threatens economic and social gains and is a potent fuel for wars and conflict’ (Lewis, 2007). Of course, this type of discourse has an instrumental purpose; security and conflict are here used for raising water/food as key policy priorities at the international level. In the Middle East, presidents, prime ministers and foreign ministers have also used this bellicose rhetoric. Boutrous Boutros-Gali said; ‘the next war in the Middle East will be over water, not politics’ (Boutros Boutros-Gali in Butts, 1997, p. 65). **The question is not whether the sharing of transboundary water sparks political tension and alarmist declaration, but rather to what extent water has been a principal factor in international conflicts. The evidence seems quite weak. Whether by president Sadat in Egypt or King Hussein in Jordan, none of these declarations have been followed up by military action.** The governance of transboundary water has gained increased attention these last decades. This has a direct impact on the global food system as water allocation agreements determine the amount of water that can used for irrigated agriculture. **The likelihood of conflicts over water is an important parameter to consider in assessing the stability, sustainability and resilience of global food systems. None of the various and extensive databases on the causes of war show water as a casus belli.** Using the International Crisis Behavior (ICB) data set and supplementary data from the University of Alabama on water conflicts, Hewitt, Wolf and Hammer found only seven disputes where water seems to have been at least a partial cause for conflict (Wolf, 1998, p. 251). In fact, about 80% of the incidents relating to water were limited purely to governmental rhetoric intended for the electorate (Otchet, 2001, p. 18). As shown in The Basins At Risk (BAR) water event database, more than two-thirds of over 1800 water-related ‘events’ fall on the ‘cooperative’ scale (Yoffe et al., 2003). Indeed, if one takes into account a much longer period, the following figures clearly demonstrate this argument. According to studies by the United Nations Food and Agriculture Organization (FAO), organized political bodies signed between the year 805 and 1984 more than 3600 water-related treaties, and approximately 300 treaties dealing with water management or allocations in international basins have been negotiated since 1945 ([FAO, 1978] and [FAO, 1984]). The fear around water wars have been driven by a Malthusian outlook which equates scarcity with violence, conflict and war. There is however no direct correlation between water scarcity and transboundary conflict. Most specialists now tend to agree that the major issue is not scarcity per se but rather the allocation of water resources between the different riparian states (see for example [Allouche, 2005], [Allouche, 2007] and [Rouyer, 2000]). Water rich countries have been involved in a number of disputes with other relatively water rich countries (see for example India/Pakistan or Brazil/Argentina). The perception of each state’s estimated water needs really constitutes the core issue in transboundary water relations. Indeed, whether this scarcity exists or not in reality, perceptions of the amount of available water shapes people’s attitude towards the environment (Ohlsson, 1999). In fact, some water experts have argued that scarcity drives the process of co-operation among riparians ([Dinar and Dinar, 2005] and [Brochmann and Gleditsch, 2006]). **In terms of international relations, the threat of water wars due to increasing scarcity does not make much sense in the light of the recent historical record. Overall, the water war rationale expects conflict to occur over water, and appears to suggest that violence is a viable means of securing national water supplies, an argument which is highly contestable**. The debates over the likely impacts of climate change have again popularised the idea of water wars. The argument runs that climate change will precipitate worsening ecological conditions contributing to resource scarcities, social breakdown, institutional failure, mass migrations and in turn cause greater political instability and conflict ([Brauch, 2002] and Pervis and Busby, 2004 Pervis, Nigel, Busby, Joshua, 2004. The Security Implications of Climate Change for the UN System. Environmental Change and Security Project Report 10, pp. 67–73.[Pervis and Busby, 2004]). In a report for the US Department of Defense, Schwartz and Randall (2003) speculate about the consequences of a worst-case climate change scenario arguing that water shortages will lead to aggressive wars (Schwartz and Randall, 2003, p. 15). **Despite growing concern that climate change will lead to instability and violent conflict, the evidence base to substantiate the connections is thin** ([Barnett and Adger, 2007] and [Kevane and Gray, 2008]).

**War causes resource scarcity – not the other way around**

**Allouche 11** – fellow at the Institute of Development Studies at Brighton, UK (Jeremy, "The sustainability and resilience of global water and food systems: Political analysis of the interplay between security, resource scarcity, political systems and global trade" Food Policy, Volume 36, Supplement 1)

**Armed conflict is the main cause of emergency food insecurity in the world today (FAO, 2000) and, hunger is routinely used as a weapon or a political tool during conflicts**. In Ethiopia for example, the government attempted to deny food to rebel forces and their supporters – livestock, farms and food stores in Tigre and Eritrea were systematically bombed (Keller, 1992, p. 620). **More generally, it has been estimated that approximately 24 million people in 28 countries across the world are hungry and in need of humanitarian assistance due to war** (Messer et al., 2001). The most affected people are usually refugees and internally displaced persons of which women and children are a large majority. The impact of armed conflict on food production and food availability is important especially in the African context where most people earn at least a part of their livelihood through agriculture or livestock keeping. **One study estimated that food production in 13 war-torn countries of Sub-Saharan Africa during 1970–1994 was on average 12.3% lower in war years compared to peace adjusted values** (Messer et al., 1998). In another study covering all developing countries the FAO estimated that from 1970 to 1997 conflict induced losses of agricultural output totalled $121 billion in real terms (or an average of $4.3 billion annually) (FAO, 2000). These impacts are not just on food production but there is also a devastating human dimension in terms of hunger and malnutrition. So far the emphasis has been on the impacts of armed conflict on food security but there is also an important post-conflict dimension. **A number of studies have shown how violent conflict in Africa plays a decisive role in the creation of conditions leading to famine** ([De Waal, 1990], [De Waal, 1993] and [Macrae and Zwi, 1994]), **and point to the changing nature of the relationship between conflict and vulnerability to famine**. As highlighted by a recent FAO study (2008), food shortages linked to conflict set the stage for years of long-term food emergencies, continuing well after fighting has ceased. **These situations can be characterized as chronic entitlement failures where communities, households and individuals who have had their assets stripped through conflict, lack the income and livelihood resources to access food and assure their food security, even where food is available** (see Macrae and Zwi, 1994). The impact of war on water is also a serious issue. Ensuring safe water and decent sanitation for civilians in conflict zones is crucial in the sense that diseases have an even large impact in terms of mortality than military casualties during conflicts. The provision of water and sanitation is of utmost priority in post-conflict states. Unsafe water equates directly with poor health, but the lack of adequate public revenues, government capacity, and investor interest often results in failure to re-establish access to basic infrastructural services (Allouche, 2010). **Overall, it seems clear that perceived resource scarcity is not an adequate explanation for war at the international level. At the national level, water and food insecurity are relatively important factors in the causes of civil wars**. At the local level, water scarcity and food insecurity may lead to local political instability and sometimes violent forms of conflict. Armed conflict creates situation of emergency food and water insecurity and has a long-term impact on post-conflict societies. In the near future, **it seems that despite climate change, international resource wars are unlikely and resource allocation will be settled through diplomatic negotiation and perhaps most importantly international trade as will be discussed in the next section.**

**No risk of resource wars**

**Pinker 11**—Harvard College Professor, Johnstone Family Professor in the Department of Psychology at Harvard University (Steven, © 2011, The Better Angels of our Nature: Why Violence has Declined, RBatra)

Once again it seems to me that the appropriate response is “maybe, but maybe not.” Though climate change can cause plenty of misery and deserves to be mitigated for that reason alone, **it will not necessarily lead to armed conflict**. The political scientists who track war and peace, such as Halvard Buhaug, Idean Salehyan, Ole Theisen, and Nils Gleditsch, are skeptical of the popular idea that people fight wars over scarce resources.290 Hunger and resource shortages are tragically common in sub-Saharan countries such as Malawi, Zambia, and Tanzania, but wars involving them are not. Hurricanes, floods, droughts, and tsunamis (such as the disastrous one in the Indian Ocean in 2004) do not generally lead to armed conflict. The American dust bowl in the 1930s, to take another example, caused plenty of deprivation but no civil war. And while temperatures have been rising steadily in Africa during the past fifteen years, civil wars and war deaths have been falling. Pressures on access to land and water can certainly cause **local skirmishes, but a genuine war requires that hostile forces be organized and armed**, and that depends more on the influence of bad governments, closed economies, and militant ideologies than on the sheer availability of land and water. Certainly any connection to terrorism is in the imagination of the terror warriors: terrorists tend to be underemployed lower-middle-class men, not subsistence farmers.291 As for genocide, the Sudanese government finds it convenient to blame violence in Darfur on desertification, distracting the world from its own role in tolerating or encouraging the ethnic cleansing.

In a regression analysis on armed conflicts from 1980 to 1992, Theisen found that conflict was more likely if a country was poor, populous, politically unstable, and abundant in oil, but not if it had suffered from droughts, water shortages, or mild land degradation. (Severe land degradation did have a small effect.) Reviewing analyses that examined a large number (N) of countries **rather than cherry-picking one or two**, he concluded, “**Those who foresee doom, because of the relationship between resource scarcity and violent internal conflict, have very little support in the large-N literature**.” Salehyan adds that relatively inexpensive advances in water use and agricultural practices in the developing world can yield massive increases in productivity with a constant or even shrinking amount of land, and that better governance can mitigate the human costs of environmental damage, as it does in developed democracies. Since the state of the environment is at most one ingredient in a mixture that depends far more on political and social organization, resource wars are far from inevitable, even in a climate-changed world.

### Aquaculture: Ext—Can’t Solve

**Can’t solve --- number of factors are driving aquaculture companies away from the U.S.**

**Knapp, 12** --- Professor of Economics at the Institute of Social and Economic Research, University of Alaska Anchorage (Gunnar, “The Political Economics of United States Marine Aquaculture,” <http://www.fra.affrc.go.jp/bulletin/bull/bull35/35-7.pdf>, JMP)

**According to a review in a recent study of why some aquaculture companies were leaving the** **U**nited **S**tates **to invest in other countries, “previous research indicates that strict regulatory environment, cost uncertainties, weak government advocacy, strong local decision-making authority, large number of coastal land owners’ opposition, environmental constraints, poor marketing” were factors** (Chu, 2009, citing Lockwood, 2001b; Anderson and Bettencourt, 1993; National Research Council, 1992).

**Number of barriers for aquaculture**

**Naylor, 6** --- Fellow at the Center for Environmental Science and Policy, Stanford University (Spring 2006, Rosamond L., “Environmental Safeguards for Open-Ocean Aquaculture,” <http://issues.org/22-3/naylor/>, JMP)

**The technology is in place for marine aquaculture development in the United States, but growth remains curtailed by the lack of unpolluted sites for shellfish production, competing uses of coastal waters, environmental concerns, and low market prices for some major commodities such as Atlantic salmon.** Meanwhile, the demand for marine fish and shellfish continues to rise more rapidly than domestic production, adding to an increasing U.S. seafood deficit (now about $8 billion annually).

### Aquaculture: Ext—No War

**Economic crisis won’t cause war**

**Barnett 9**—senior managing director of Enterra Solutions LLC (Thomas, The New Rules: Security Remains Stable Amid Financial Crisis, 25 August 2009, http://www.aprodex.com/the-new-rules--security-remains-stable-amid-financial-crisis-398-bl.aspx, AMiles)

When the global financial crisis struck roughly a year ago, the blogosphere was ablaze with all sorts of scary predictions of, and commentary regarding, ensuing conflict and wars -- a rerun of the Great Depression leading to world war, as it were. Now, as global economic news brightens and recovery -- surprisingly led by China and emerging markets -- is the talk of the day, it's interesting to look back over the past year and realize how globalization's first truly worldwide recession has had virtually no impact whatsoever on the international security landscape. None of the more than three-dozen ongoing conflicts listed by GlobalSecurity.org can be clearly attributed to the global recession. Indeed, the last new entry (civil conflict between Hamas and Fatah in the Palestine) predates the economic crisis by a year, and three quarters of the chronic struggles began in the last century. Ditto for the 15 low-intensity conflicts listed by Wikipedia (where the latest entry is the Mexican "drug war" begun in 2006). Certainly, the Russia-Georgia conflict last August was specifically timed, but by most accounts the opening ceremony of the Beijing Olympics was the most important external trigger (followed by the U.S. presidential campaign) for that sudden spike in an almost two-decade long struggle between Georgia and its two breakaway regions. Looking over the various databases, then, we see a most familiar picture: the usual mix of civil conflicts, insurgencies, and liberation-themed terrorist movements. Besides the recent Russia-Georgia dust-up, the only two potential state-on-state wars (North v. South Korea, Israel v. Iran) are both tied to one side acquiring a nuclear weapon capacity -- a process wholly unrelated to global economic trends. And with the United States effectively tied down by its two ongoing major interventions (Iraq and Afghanistan-bleeding-into-Pakistan), our involvement elsewhere around the planet has been quite modest, both leading up to and following the onset of the economic crisis: e.g., the usual counter-drug efforts in Latin America, the usual military exercises with allies across Asia, mixing it up with pirates off Somalia's coast). Everywhere else we find serious instability we pretty much let it burn, occasionally pressing the Chinese -- unsuccessfully -- to do something. Our new Africa Command, for example, hasn't led us to anything beyond advising and training local forces. So, to sum up: •No significant uptick in mass violence or unrest (remember the smattering of urban riots last year in places like Greece, Moldova and Latvia?); •The usual frequency maintained in civil conflicts (in all the usual places); •Not a single state-on-state war directly caused (and no great-power-on-great-power crises even triggered); •No great improvement or disruption in great-power cooperation regarding the emergence of new nuclear powers (despite all that diplomacy); •A modest scaling back of international policing efforts by the system's acknowledged Leviathan power (inevitable given the strain); and •No serious efforts by any rising great power to challenge that Leviathan or supplant its role. (The worst things we can cite are Moscow's occasional deployments of strategic assets to the Western hemisphere and its weak efforts to outbid the United States on basing rights in Kyrgyzstan; but the best include China and India stepping up their aid and investments in Afghanistan and Iraq.) Sure, we've finally seen global defense spending surpass the previous world record set in the late 1980s, but even that's likely to wane given the stress on public budgets created by all this unprecedented "stimulus" spending. If anything, the friendly cooperation on such stimulus packaging was the most notable great-power dynamic caused by the crisis. Can we say that the world has suffered a distinct shift to political radicalism as a result of the economic crisis? Indeed, no. The world's major economies remain governed by center-left or center-right political factions that remain decidedly friendly to both markets and trade. In the short run, there were attempts across the board to insulate economies from immediate damage (in effect, as much protectionism as allowed under current trade rules), but there was no great slide into "trade wars." Instead, the World Trade Organization is functioning as it was designed to function, and regional efforts toward free-trade agreements have not slowed. Can we say Islamic radicalism was inflamed by the economic crisis? If it was, that shift was clearly overwhelmed by the Islamic world's growing disenchantment with the brutality displayed by violent extremist groups such as al-Qaida. And looking forward, austere economic times are just as likely to breed connecting evangelicalism as disconnecting fundamentalism. At the end of the day, the economic crisis did not prove to be sufficiently frightening to provoke major economies into establishing global regulatory schemes, even as it has sparked a spirited -- and much needed, as I argued last week -- discussion of the continuing viability of the U.S. dollar as the world's primary reserve currency. Naturally, plenty of experts and pundits have attached great significance to this debate, seeing in it the beginning of "economic warfare" and the like between "fading" America and "rising" China. And yet, in a world of globally integrated production chains and interconnected financial markets, such "diverging interests" hardly constitute signposts for wars up ahead. Frankly, I don't welcome a world in which America's fiscal profligacy goes undisciplined, so bring it on -- please! Add it all up and it's fair to say that this global financial crisis has proven the great resilience of America's post-World War II international liberal trade order.

**Economic decline doesn’t cause war**

**Ferguson 6** (Niall, Professor of History – Harvard University, Foreign Affairs, 85(5), September / October, Lexis)

Nor can economic crises explain the bloodshed. What may be the most familiar causal chain in modern historiography links the Great Depression to the rise of fascism and the outbreak of World War II. But that simple story leaves too much out. Nazi Germany started the war in Europe only after its economy had recovered. Not all the countries affected by the Great Depression were taken over by fascist regimes, nor did all such regimes start wars of aggression. In fact, **no** general **relationship between economics and conflict is discernible** for the century as a whole. Some wars came after periods of growth, others were the causes rather than the consequences of economic catastrophe, and some **severe economic crises were not followed by wars**.

## Adv: Desalination

### Desal: 1NC

**Squo solves desalination – US tech increasing now**

**Leven 13** (8/21/13, Rachel Leven – a reporter for Bloomberg BNA, http://www.bna.com/us-desalination-industry-n17179876105/)

**With supplies of clean water becoming more scarce in certain areas and demand increasing, desalination is on the rise in the United States**, water professionals told BNA.¶ **Half again as many municipal desalination plants were built between 2000 and 2010 as were built in the preceding three decades**, according to research by water sector consultant Mike Mickley that was published in 2012 in the IDA Journal of Desalination and Water Reuse, the journal of the International Desalination Association.¶ During that decade, 117 municipal desalination plants were constructed, bringing the total to 324 plants built since 1971, Mickley wrote in his article, “US Municipal Desalination Plants: Number, Types, Locations, Sizes, and Concentrate Management Practices.” Those figures include municipal plants with the capacity to produce 25,000 gallons per day or more of potable water.¶ **Desalination grew significantly due to improved technology, a decline in cost, and dwindling supplies of water in the face of heightened demand**, according to researchers, local water managers, and government officials. Many of these officials say **desalination will continue to grow,** although some are unsure if the industry will be able to overcome the hurdles posed by regulatory requirements. Most water professionals emphasized the need for desalination to play a key role in meeting future water needs.

**Desalination is bad – laundry list**

**McIntyre and Fried 9** (Rich McIntyre and Kate Fried, 2/4/9, “Ocean Desalination No Solution to Water Shortages,” <http://www.foodandwaterwatch.org/pressreleases/ocean-desalination-no-solution-to-water-shortages/>)

Desalination is expensive. Although the price tag varies by region and is often obscured by corporate underestimates and government subsidies, it is more often two to four times as costly as traditional options.¶ **Desalination is bad for the environment and human health**. **The by-products of desalination include coagulalants, bisulfates, and chlorines. When concentrated waste is dumped into the ocean as it is with desalination, it is harmful to marine life and environments.** Furthermore, power plants’ intake mechanisms, which are often teamed with desalination plants, kill at least 3.4 billion fish and other marine organisms annually. In addition to upsetting marine environments, desalination causes fishermen to lose at least 165 million pounds of fish a year today and 717.1 million pounds of potential future catch.¶ **Desalted water also puts drinking water supplies at risk because seawater contains chemicals such as boron, that freshwater does not**. **Boron, only 50 to 70 percent of which is removed through the desalination process, has been found to cause reproductive problems and developmental problems in animals and irritation of the human digestive track. Current drinking water regulations do not protect the public from boron.**¶ **Desalination contributes to global warming and requires large amounts of energy. Removing salt from large volumes of water takes nine times as much energy as surface water treatment and 14 times as much energy as groundwater protection**. **Emissions created by desalination plants contribute to climate change, a leading factor of the droughts and water shortages the process is intended to mitigate**.¶ **Desalination turns water into a commodity. Private corporations are investing in desalination because it is a leading growth area in the global water market. As water becomes a scarcer commodity, global corporations are setting themselves up to sell water for a profit.** Furthermore, private control of water makes in much harder to ensure public safety.

#### Disease can’t cause extinction – it’s genetically impossible

Richard **Posner**, Senior Lecturer in Law at the University of Chicago, judge on the United States Court of Appeals for the Seventh Circuit, January 1, **2005**, Skeptic, “Catastrophe: the dozen most significant catastrophic risks and what we can do about them,” <http://goliath.ecnext.com/coms2/gi_0199-4150331/Catastrophe-the-dozen-most-significant.html#abstract>

Yet the fact that Homo sapiens has managed to survive every disease to assail it in the 200,000 years or so of its existence is a source of genuine comfort, at least if the focus is on extinction events. There have been enormously destructive plagues, such as the Black Death, smallpox, and now AIDS, but none has come close to destroying the entire human race. There is a biological reason. Natural selection favors germs of limited lethality; they are fitter in an evolutionary sense because their genes are more likely to be spread if the germs do not kill their hosts too quickly. The AIDS virus is an example of a lethal virus, wholly natural, that by lying dormant yet infectious in its host for years maximizes its spread. Yet there is no danger that AIDS will destroy the entire human race. The likelihood of a natural pandemic that would cause the extinction of the human race is probably even less today than in the past (except in prehistoric times, when people lived in small, scattered bands, which would have limited the spread of disease), despite wider human contacts that make it more difficult to localize an infectious disease. The reason is improvements in medical science. But the comfort is a small one. Pandemics can still impose enormous losses and resist prevention and cure: the lesson of the AIDS pandemic. And there is always a lust time.

#### No Middle East war

**Maloney and Takeyh, 7** – \*senior fellow for Middle East Policy at the Saban Center for Middle East Studies at the Brookings Institution AND \*\*senior fellow for Middle East Studies at the Council on Foreign Relations (Susan and Ray, International Herald Tribune, 6/28, “Why the Iraq War Won't Engulf the Mideast”, http://www.brookings.edu/opinions/2007/0628iraq\_maloney.aspx)

Yet, the Saudis, Iranians, Jordanians, Syrians, and others are very unlikely to go to war either to protect their own sect or ethnic group or to prevent one country from gaining the upper hand in Iraq. The reasons are fairly straightforward. First, Middle Eastern leaders, like politicians everywhere, are primarily interested in one thing: self-preservation. Committing forces to Iraq is an inherently risky proposition, which, if the conflict went badly, could threaten domestic political stability. Moreover, most Arab armies are geared toward regime protection rather than projecting power and thus have little capability for sending troops to Iraq. Second, there is cause for concern aboutthe so-called blowback scenario in which jihadis returning from Iraq destabilize their home countries, plunging the region into conflict. Middle Eastern leaders are preparing for this possibility. Unlike in the 1990s, when Arab fighters in the Afghan jihad against the Soviet Union returned to Algeria, Egypt and Saudi Arabia and became a source of instability, Arab security services are being vigilant about who is coming in and going from their countries. In the last month, the Saudi government has arrested approximately 200 people suspected of ties with militants. Riyadh is also building a 700 kilometer wall along part of its frontier with Iraq in order to keep militants out of the kingdom. Finally, there is no precedent for Arab leaders to commit forces to conflicts in which they are not directly involved. The Iraqis and the Saudis did send small contingents to fight the Israelis in 1948 and 1967, but they were either ineffective or never made it. In the 1970s and 1980s, Arab countries other than Syria, which had a compelling interest in establishing its hegemony over Lebanon, never committed forces either to protect the Lebanese from the Israelis or from other Lebanese. The civil war in Lebanon was regarded as someone else's fight. Indeed, this is the way many leaders view the current situation in Iraq. To Cairo, Amman and Riyadh, the situation in Iraq is worrisome, but in the end it is an Iraqi and American fight. As far as Iranian mullahs are concerned, they have long preferred to press their interests through proxies as opposed to direct engagement. At a time when Tehran has access and influence over powerful Shiite militias, a massive cross-border incursion is both unlikely and unnecessary. So Iraqis will remain locked in a sectarian and ethnic struggle that outside powers may abet, but will remain within the borders of Iraq. The Middle East is a region both prone and accustomed to civil wars. But given its experience with ambiguous conflicts, the region has also developed an intuitive ability to contain its civil strife and prevent local conflicts from enveloping the entire Middle East.

#### Great powers won’t get involved

**Barrett 5** (Robert, Ph.D. Student in the Centre for Military and Strategic Studies – University of Calgary, “Understanding the Challenges of African Democratization through Conflict Analysis”, 6-1, http://papers.ssrn.com/sol3/papers.cfm?abstract\_id=726162)

Westerners eager to promote democracy must be wary of African politicians who promise democratic reform without sincere commitment to the process. Offering money to corrupt leaders in exchange for their taking small steps away from autocracy may in fact be a way of pushing countries into anocracy. As such, world financial lenders and interventionists who wield leverage and influence must take responsibility in considering the ramifications of African nations who adopt democracy in order to maintain elite political privileges. The obvious reason for this, aside from the potential costs in human life should conflict arise from hastily constructed democratic reforms, is the fact that Western donors, in the face of intrastate e war would then be faced with channeling funds and resources away from democratization efforts and toward conflict intervention based on issues of human security. This is a problem, as Western nations may be increasingly wary of intervening in Africa hotspots after experiencing firsthand the unpredictable and unforgiving nature of societal warfare in both Somalia and Rwanda. On a cost benefit basis, the West continues to be somewhat reluctant to get to get involved in Africa’s dirty wars, evidenced by its political hesitation when discussing ongoing sanguinary grassroots conflicts in Africa. Even as the world apologizes for bearing witness to the Rwandan genocide without having intervened, the United States, recently using the label ‘genocide’ in the context of the Sudanese conflict (in September of 2004), has only proclaimed sanctions against Sudan, while dismissing any suggestions at actual intervention (Giry, 2005). Part of the problem is that traditional military and diplomatic approaches at separating combatants and enforcing ceasefires have yielded little in Africa. No powerful nations want to get embroiled in conflicts they cannot win– especially those conflicts in which the intervening nation has very little interest.

#### No water wars

**Barnaby ‘9** (Wendy, editor of People & Science, the magazine published by the British Science Association, “Do nations go to war over water?,” March 19th, <http://www.nature.com/nature/journal/v458/n7236/full/458282a.html>)

The United Nations warned as recently as last week that climate change harbours the potential for serious conflicts over water. In its World Water Development Report1 of March 2009, it quotes UN Secretary-General Ban Ki-moon noting the risk of water scarcity "transforming peaceful competition into violence". It is statements such as this that gave birth to popular notions of 'water wars'. It is time we dispelled this myth. *Countries do not go to war over water,* they solve their water shortages through trade and international agreements. Cooperation, in fact, *is the dominant response* to shared water resources. There are *263*cross-boundarywaterways in the world. Between 1948 and 1999, cooperation over water, including the signing of treaties, *far outweighed* conflict over water and violent conflict in particular. Of 1,831 instances of interactions over international freshwater resources tallied over that time period (including everything from unofficial verbal exchanges to economic agreements or military action), 67% were cooperative, only 28% were conflictive, and the remaining 5% were neutral or insignificant. In those five decades, there were *no formal declarations of war over water*.

### Desal: Ext—Desal Now

#### Desalination is on the rise now—new plants are being built

D&WR 13 (International Desalination and Water Reuse Quarterly, October 14, "Desalination capacity increasing by 50% in 2013 says IDA") [www.desalination.biz/news/news\_story.asp?id=7276](http://www.desalination.biz/news/news_story.asp?id=7276)

Desalination plants with a total capacity of 6 million m³/d are expected to come on line during 2013, a 50% increase on 2012, according to new data from the International Desalination Association and GWI DesalData. The new capacity takes the total capacity of all 17,277 commissioned desalination plants in the world to 80.9 million m³/d. An increasing proportion of the growth in capacity is coming from the industrial sector. Since 2010, which exceeded the current figures, 45% of new desalination plants have been ordered by industrial users such as power stations and refineries, while in the previous four years, only 27% of new capacity was ordered by industry. Industrial applications for desalination grew to 7.6 million m³/d for 2010‑2013 (compared with 5.9 million m³/d for 2006‑2009). Of this, the power industry accounted for 16%; oil & gas ‑ 12% (up from 7% from 2006‑2009); mining & metals ‑ 11%; refining & chemicals, 11%; electronics ‑ 5%; and food & beverages ‑ 3%. Other industrial applications accounted for the remaining 40%. "Ongoing enhancements in energy efficiency continue to be a key focus for the desalination industry," said Patricia Burke, IDA Secretary General. "While we have made significant improvements in the past couple of decades, we continue to seek additional ways to reduce energy requirements through development of new technologies, implementation of best practices and/or retrofits in existing plants, increased use of hybrid technologies, and efforts to harness the potential of renewable energy to power desalination plants." Seawater desalination continues to represents the largest percentage of online global capacity at 59%, followed by brackish water at 22%, river water at 9%, and wastewater and pure water at 5% each.

### Desal: Ext—Desal Bad

**Desalination has negative effects on the environment**

**Cooley et al 13** (Heather Cooley, Newsha Ajami, Matthew Heberger, 12/11/13, “Key Issues in Seawater Desalination in California: Marine Impacts”, <http://pacinst.org/publication/desal-marine-impacts/>)

Modern reverse-osmosis desalination plants, such as those planned or proposed on the California coast, take in large volumes of seawater – generally two gallons are withdrawn for every gallon of freshwater produced – and pass it through fine-pored membranes to separate freshwater from salt. The highly concentrated brine is then typically disposed of back into the ocean.¶ **With the majority of desalination plants extracting water directly through open water intakes in the ocean, there is a direct impact on marine life.** Fish and other marine organisms are killed on the intake screens (impingement); organisms small enough to pass through, such as plankton, fish eggs, and larvae, are killed during processing of the salt water (entrainment). The impacts on the marine environment, even for a single desalination plant, may be subject to daily, seasonal, annual, and even decadal variation, and are likely to be species- and site-specific.¶ These impacts, however, are not well understood. More research is needed, especially to understand the long-term impacts. We do, however, know that there are several operational, design, and technological measures available to reduce the marine impacts of open water intakes. In particular, subsurface intakes can virtually eliminate impingement and entrainment, as they extract seawater from beneath the seafloor or a beach. The sand acts as a natural filter, providing a level of pre-filtration that can reduce plant chemical and energy use and long-term operating costs.¶ “Subsurface intakes are being used in a growing number of plants around the world, as new drilling technologies – like the directional drilling that has made hydraulic fracturing possible – have made subsurface intakes possible in more locations. Now, even where the site is surrounded by generally unfavorable conditions, it may be possible to find a pocket with the right ones,” said Heather Cooley, co-director of the Pacific Institute Water Program.¶ **Another major environmental challenge of desalination is the disposal of the highly concentrated salt brine that contains other chemicals used throughout the process**. Because all large coastal seawater desalination plants discharge brine into oceans and estuaries, including all of the proposed plants in California, steps must be taken to ensure its safe disposal; at this stage**, we know very little about the long-term impacts of brine disposal on the marine environment. Twice as saline as the ocean, the brine is denser than the waters into which it is discharged and tends to sink and slowly spread along the ocean floor, where there is typically little wave energy to mix it**. There are several proven methods to disperse concentrated brine, such as multi-port diffusers placed on the discharge pipe to promote mixing. Brine can also be diluted with effluent from a wastewater treatment plant or with cooling water from a power plant or other industrial user, although these approaches have their own drawbacks that must be addressed.

**Desalination plants harm more than help- organisms killed, CO2, and disease.**

**Leven 13** (8/21/13, she has worked in Washington, DC, for The Hill and USA Today. She currently a reporter with Bloomberg BNA's environment and safety desk. She covers mining, enforcement, pipeline safety and hazardous materials transportation. She has had experience tracking lobbyists, the role of super-PACs in the 2012 election and the passage of the Dodd-Frank financial regulatory reform. She is a skilled in database analysis and has reported using several federal agency databases, including the Office of Management and Budget and the U.S. Securities and Exchange Commission., <http://www.bna.com/us-desalination-industry-n17179876105/>)

**Many desalination facilities run on fossil fuels, which generate greenhouse gases**, according to the CRS report, although desalinating brackish water requires less energy than desalinating seawater. According to the Sierra Club's Lone Star Chapter in Texas, **the increase in energy production-**-if not shifted to renewable energy such as wind or solar--**would ultimately lead to increased pollution and greenhouse gas emissions**. Nonetheless, the Lone Star Chapter in a 2008 report, [Desalination: Is It Worth Its Salt?](http://texas.sierraclub.org/press/Desalination.pdf), said that **desalination can be a suitable part of a water management plan, if used selectively and appropriately. Desalination facilities** can also **have** adverse **impacts on aquatic life in** the areas near **the intake pipes.** Fish and other **organisms** can **get sucked into the pipes or become trapped against the screens intended to filter material,** the Lone Star Chapter report said. **These could ultimately injure or kill the** **organisms**, unless different technologies are used or the rate at which water is withdrawn is reduced. Moreover, **water that is not properly “post-treated” after desalination can be contaminated with harmful byproducts**, such as brominated organic byproducts and chlorinated byproducts, **or can be missing good components such as magnesium and calcium that were filtered out**, the Lone Star Chapter report said. Ultimately, **many water associations are viewing how desalination actions today could affect the country's water supplies for the future.** Water being pumped from the ground or the sea links to other freshwater resources and the environment overall, meaning drawing on groundwater for desalination may eventually affect a water source somewhere else. The effects are not necessarily clear, William Alley, National Ground Water Association director of science and technology and former U.S. Geological Survey Office of Groundwater chief, told BNA.

**The increased production of desalination plants is likely to lead to improper disposal of wastes.**

**Leven 13** (8/21/13, she has worked in Washington, DC, for The Hill and USA Today. She currently a reporter with Bloomberg BNA's environment and safety desk. She covers mining, enforcement, pipeline safety and hazardous materials transportation. She has had experience tracking lobbyists, the role of super-PACs in the 2012 election and the passage of the Dodd-Frank financial regulatory reform. She is a skilled in database analysis and has reported using several federal agency databases, including the Office of Management and Budget and the U.S. Securities and Exchange Commission., <http://www.bna.com/us-desalination-industry-n17179876105/>)

**One of the largest concerns** among desalination professionals **is the disposal of concentrate generated through the treatment process. The concentrate encompasses** a significant amount of **salt waste that requires proper disposal**. **If it is discharged to surface waters**, according to the CRS report, **it can pose risks to aquatic organisms. Finding an** environmentally friendly **way to dispose of the waste is** one **of the most costly aspects of desalination**. Options range from using a pipeline to send the leftover salt out to sea and dispersing it to injecting the discharge into deep wells, Lisa Henthorne, former International Desalination Association president and director, said. The Texas Sierra Club's report said that, if done correctly, these concerns could be mitigated and desalination could prove to be an asset. The report cautions that **desalination should only be used in situations where it is the most “appropriate, environmentally sound and cost-effective tool,”** however. “With proper planning, siting, attention to all energy and environmental factors, and thorough evaluation of the full costs of operation, desalination plants could be a significant part of a comprehensive water supply program that also includes advanced water conservation and effective drought management measures,” the report said.

**The process of desalination plants are more harmful than expected- Kills keystone organisms= biodiversity loss.**

**Scientific American 09** (1/20/09, http://www.scientificamerican.com/article/the-impacts-of-relying-on-desalination/)

The relationship between desalinization and climate change is complex. Global warming has increased droughts around the world and turned formerly verdant landscapes into near deserts. Some long held fresh water sources are simply no longer reliably available to hundreds of millions of people around the world. Meanwhile, expanding populations in desert areas are putting intense pressure on existing fresh water supplies, forcing communities to turn to desalinization as the most expedient way to satisfy their collective thirst. But **the process of desalinization burns up many more fossil fuels than** sourcing **the** equivalent **amount of fresh water from fresh water bodies**. As such, the very proliferation of desalinization plants around the world‚ some 13,000 already supply fresh water in 120 nations, primarily in the Middle East, North Africa and Caribbean, is both a reaction to and one of many contributors to global warming. Beyond the links to climate problems, **marine biologists warn that** widespread **desalinization could take a heavy toll on ocean biodiversity; as such facilities' intake pipes** essentially vacuum up and inadvertently **kill millions of plankton, fish eggs, fish larvae and other microbial organisms** that constitute the base layer of the marine food chain. And, according to Jeffrey Graham of the Scripps Institute of Oceanography's Center for Marine Biotechnology and Biomedicine, the salty sludge leftover after desalinization for **every gallon of freshwater produced, another gallon of doubly concentrated salt water must be disposed of** can wreak havoc on marine ecosystems if dumped willy-nilly offshore. For some desalinization operations, says Graham, it is thought that **the disappearance of some organisms from discharge areas may be related to the salty outflow.**

**Desalination plants= loss of organisms lower in the food chain, global warming, and rising salt levels.**

**Francis No Date** ( No Date, Nature is my greatest passion, along with cinema, literature, and good tea. I'm a new environmental professional and recent UCLA graduate in environmental science. Journaling, hiking and camping are some of my favorite ways to spend time, and I'm a strong believer in positive thinking and loving the world. http://greenopedia.com/article/desalination-seawater-can-do-more-harm-good)

As our climate changes and sea levels rise, there are less fresh water sources available. And as our population grows, there is an even greater need for clean drinking water solutions. One answer to this challenge is ocean desalination, a process that removes salt and other minerals from seawater, making it safe to drink. **Desalination** seems like a viable solution. But as it turns out, its **environmental effects can be devastating. Ocean desalination plants** are located just off the coast, where their **intake pipes suck in billions of fish, eggs, and** other small **organisms every day, along with the seawater**. Once these living organisms enter the machinery of the desalination plant, **they are killed**. **This represents a huge loss of life and could potentially destroy entire ecosystems**. Additionally, **the high energy levels needed to run these plants may also contribute to environmental problems. The desalination process requires huge amounts of electricity** to separate drinkable water from dissolved salts and other minerals. **Burning** [**fossil fuels**](http://greenopedia.com/glossary#Fossil_fuels) **is the most common method of attaining this energy, which**, of course, **contributes to air pollution and the** [**greenhouse gas effect**](http://greenopedia.com/glossary#Greenhouse_gas_effect)**.** In addition to the machines themselves, another serious environmental concern is the quality of the water put back into the ocean after the drinkable water is collected. This outflow is called brine because of its extremely high salt content (all of the non-salty water has been removed). Not only does brine have more salt than natural seawater, it also commonly contains leftover chemicals and metals from the treatment process.

### Desal: Ext—No Mideast War

#### Shared interests check escalation

**Gelb, 10** – President Emeritus of the Council on Foreign Relations. He was a senior official in the U.S. Defense Department from 1967 to 1969 and in the State Department from 1977 to 1979 (Leslie, Foreign Affairs, “GDP Now Matters More Than Force: A U.S. Foreign Policy for the Age of Economic Power,” November/December, proquest)

Also reducing the likelihood of conflict today is that there is no arena in which the vital interests of great powers seriously clash. Indeed, the most worrisome security threats today-rogue states with nuclear weapons and terrorists with weapons of mass destruction-actually tend to unite the great powers more than divide them. In the past, and specifically during the first era of globalization, major powers would war over practically nothing. Back then, they fought over the Balkans, a region devoid of resources and geographic importance, a strategic zero. Today, they are unlikely to shoulder their arms over almost anything, even the highly strategic Middle East. All have much more to lose than to gain from turmoil in that region. To be sure, great powers such as China and Russia will tussle with one another for advantages, but they will stop well short of direct confrontation.

### Desal: Ext—No Disease Impact

#### Intervening actors check disease impact

**Zakaria 9—**Editor of Newsweek, BA from Yale, PhD in pol sci, Harvard. He serves on the board of Yale University, The Council on Foreign Relations, The Trilateral Commission, and Shakespeare and Company. Named "one of the 21 most important people of the 21st Century" (Fareed, “The Capitalist Manifesto: Greed Is Good,” 13 June 2009, http://www.newsweek.com/id/201935)

Note—Laurie Garrett=science and health writer, winner of the Pulitzer, Polk, and Peabody Prize

It certainly looks like another example of crying wolf. After bracing ourselves for a global pandemic, we've suffered something more like the usual seasonal influenza. Three weeks ago the World Health Organization declared a health emergency, warning countries to "prepare for a pandemic" and said that the only question was the extent of worldwide damage. Senior officials prophesied that millions could be infected by the disease. But as of last week, the WHO had confirmed only 4,800 cases of swine flu, with 61 people having died of it. Obviously, these low numbers are a pleasant surprise, but it does make one wonder, what did we get wrong? Why did the predictions of a pandemic turn out to be so exaggerated? Some people blame an overheated media, but it would have been difficult to ignore major international health organizations and governments when they were warning of catastrophe. I think there is a broader mistake in the way we look at the world. Once we see a problem, we can describe it in great detail, extrapolating all its possible consequences. But **we** can rarely **anticipate the human response to that crisis**. Takeswine flu. The virushad crucial characteristicsthat led researchers to worry that it could spread far and fast. They described—and the media reported—what would happen if it went unchecked. But it did not go unchecked. In fact, swine flu was met by an extremely vigorousresponse at its epicenter, Mexico. The Mexican government reacted quickly and massively, quarantining the infected population, testing others, providing medication to those who needed it. The noted expert on this subject, Laurie Garrett, says, "We should all stand up and scream, 'Gracias, Mexico!' because the Mexican people and the Mexican government have sacrificed on a level that I'm not sure as Americans we would be prepared to do in the exact same circumstances. They shut down their schools. They shut down businesses, restaurants, churches, sporting events. They basically paralyzed their own economy. They've suffered billions of dollars in financial losses still being tallied up, and thereby really brought transmission to a halt." Every time one of these viruses is detected, writers and officials bring up the Spanish influenza epidemic of 1918 in which millions of people died. Indeed, during the last pandemic scare, in 2005, President George W. Bush claimed that he had been reading a history of the Spanish flu to help him understand how to respond. But the world we live in today looks nothing like 1918. Public health-care systems are far better and more widespread than anything that existed during the First World War. Even Mexico, a developing country, has a first-rate public-health system—far better than anything Britain or France had in the early 20th century.

#### No mutation to a more virulent strain – more likely to develop into a less dangerous strain

**Avian Flu Diary 11**, 1/10/11, “Egyptian MOH:`No Mutation’ Of Flu”, <http://afludiary.blogspot.com/2011/01/egyptian-mohno-mutation-of-flu.html>

Invariably, when a new or novel influenza virus makes an appearance on the world stage, the concern is that over time it willmutate to a more formidable viral foe.   Mutating is, after all, what viruses do. And influenza viruses are particularly adept at acquiring changes – either through small incremental changes (called `drift’), or via a reassortment or swapping of genetic material with another virus, called `shift’. And as any virologist will tell you, Shift Happens. Yet, despite the stigma attached to the word`mutation’, virusescanalso mutate into a **less dangerous strains**. Over the past few days we are seeing public reassurances from some public health agencies that the swine flu virus has not `mutated’ into a more virulent strain.   Last week, scientists from the UK’s [HPA](http://www.hpa.org.uk/), writing in[Eurosurveillance](http://www.eurosurveillance.org/) (see [Eurosurveillance: Analysis Of Fatal H1N1 Cases In The UK](http://afludiary.blogspot.com/2011/01/eurosurveillance-analysis-of-fatal-h1n1.html" \t "_blank)) stated that: so far no unique mutations have been associated with severe or fatal cases of influenza A(H1N1)2009, but further comprehensive analysis is required.   That isn’t to say that mutations haven’t shown up.  They have, and will no doubt continue to do so.     But so far, none of these changes is viewed by these HPA researchers as particularly alarming, linked to fatal cases, or indicative of a fundamental change in the H1N1 virus.

### Desal: Ext—No Africa War Impact

#### War in africa does not escalate

**Alexander 95** - (Bevin, Professor and Director of the Inter-University Institution for Terrorism Studies, The Future of Warfare)

The United States also will be reluctant to enter into conflicts in Africa, unless a major outside power tries to gain control of a region, as was the case with Soviet incursions during the Cold War, or unless one power attempts to corral the supply of vital minerals such as cobalt, chromium, or manganese. Without such incursions, African conflicts constitute little international danger because the continent does not possess enough inherent military or economic power to threaten the world. That is why the United States hasignored, militarily at least, the civil wars or ethnic conflicts in Rwanda, Liberia, Chad, Mozambique, Sudan, and elsewhere. It intervened in Somalia primarily to halt starvation.

### Desal: Ext—Water Wars Defense

#### Their ev is bad scholarship

Barnaby ‘9 (Wendy, editor of People & Science, the magazine published by the British Science Association, “Do nations go to war over water?,” March 19th, <http://www.nature.com/nature/journal/v458/n7236/full/458282a.html>)

Yet the myth of water wars persists. Climate change, we are told, will cause water shortages. The Intergovernmental Panel on Climate Change estimates that up to 2 billion people may be at risk from increasing water stress by the 2050s, and that this number could rise to 3.2 billion by the 2080s7. Water management will need to adapt. But the mechanisms of trade, international agreements and economic development that currently ease water shortages will persist. Researchers, such as Aaron Wolf at Oregon State University, Corvallis, and Nils Petter Gleditsch at the International Peace Research Institute in Oslo, point out that predictions of armed conflict come from the media and from popular, non-peer-reviewed work .There is something other than water for which shortages, or even the perceived threat of future shortages, does cause war — oil. But the strategic significance of oil is immeasurably higher than that of water. Serious interruptions of oil supplies would stop highly developed economies in their tracks. Oil is necessary for a developed economy, and a developed economy provides for all the needs of its citizens, including water. People in developed economies do not die of thirst. My encounter with Allan's work killed my book. I offered to revise its thesis, but my publishers pointed out that predicting an absence of war over water would not sell.

## Adv: Hydrogen

### Hydrogen: 1NC

**Hydrogen production uses more energy than it gains**

Zyga 6 (Liza Zyga 2006 Physorg, Bossel, Ulf. “Does a Hydrogen Economy Make Sense?” Proceedings of the IEEE. Vol. 94, No. 10, October 2006. http://phys.org/news85074285.html)

In a recent study, fuel cell expert Ulf **Bossel explains that** a hydrogen economy is a wasteful economy. **The** large **amount of energy required to isolate hydrogen** from natural compounds (water, natural gas, biomass), package the light gas by compression or liquefaction, transfer the energy carrier to the user, plus the energy lost when it is converted to useful electricity with fuel cells, **leaves** around 25% for practical use — **an unacceptable value to run an economy in a sustainable future**. Only niche applications like submarines and spacecraft might use hydrogen. “**More energy is needed to isolate hydrogen** from natural compounds **than can ever be recovered from its use**,” Bossel explains to PhysOrg.com. “**Therefore, making the new chemical energy carrier form natural gas would not make sense, as it would increase the gas consumption and the emission of CO2**. Instead, the dwindling fossil fuel reserves must be replaced by energy from renewable sources.” While scientists from around the world have been piecing together the technology, Bossel has taken a broader look at how realistic the use of hydrogen for carrying energy would be. His overall energy analysis of a hydrogen economy demonstrates that high energy losses inevitably resulting from the laws of physics mean that a hydrogen economy will never make sense. “The advantages of hydrogen praised by journalists (non-toxic, burns to water, abundance of hydrogen in the Universe, etc.) are misleading, because the production of hydrogen depends on the availability of energy and water, both of which are increasingly rare and may become political issues, as much as oil and natural gas are today,” says Bossel. “**Ultimately, hydrogen has to be made from renewable electricity by electrolysis of water in the beginning**,” Bossel explains, “and then its energy content is converted back to electricity with fuel cells when it’s recombined with oxygen to water. **Separating hydrogen from water by electrolysis requires massive amounts of electrical energy and substantial amounts of water**.” Also, hydrogen is not a source of energy, but only a carrier of energy. As a carrier, it plays a role similar to that of water in a hydraulic heating system or electrons in a copper wire. When delivering hydrogen, whether by truck or pipeline, the energy costs are several times that for established energy carriers like natural gas or gasoline. Even the most efficient fuel cells cannot recover these losses, Bossel found. For comparison, the "wind-to-wheel" efficiency is at least three times greater for electric cars than for hydrogen fuel cell vehicles. Another headache is storage. When storing liquid hydrogen, some gas must be allowed to evaporate for safety reasons—meaning that after two weeks, a car would lose half of its fuel, even when not being driven. Also, Bossel found that the output-input efficiency cannot be much above 30%, while advanced batteries have a cycle efficiency of above 80%. In every situation, Bossel found, the energy input outweighs the energy delivered by a factor of three to four. “About four renewable power plants have to be erected to deliver the output of one plant to stationary or mobile consumers via hydrogen and fuel cells,” he writes. “Three of these plants generate energy to cover the parasitic losses of the hydrogen economy while only one of them is producing useful energy.” This fact, he shows, cannot be changed with improvements in technology. Rather, the one-quarter efficiency is based on necessary processes of a hydrogen economy and the properties of hydrogen itself, e.g. its low density and extremely low boiling point, which increase the energy cost of compression or liquefaction and the investment costs of storage. “There is a lot of money in the field now,” he continues. “I think that it was a mistake to start with a ‘Presidential Initiative’ rather with a thorough analysis like this one. Huge sums of money were committed too soon, and now even good scientists prostitute themselves to obtain research money for their students or laboratories—otherwise, they risk being fired. But the laws of physics are eternal and cannot be changed with additional research, venture capital or majority votes.” **Even though many scientists**, including Bossel, **predict that the technology to establish a hydrogen economy is within reach, its implementation will never make economic sense**, Bossel argues. “In the market place, hydrogen would have to compete with its own source of energy, i.e. with ("green") electricity from the grid,” he says. “For this reason, creating a new energy carrier is a no-win solution. **We have to solve an energy problem not an energy carrier problem**." A wasteful process In his study, Bossel analyzes a variety of methods for synthesizing, storing and delivering hydrogen, since no single method has yet proven superior. To start, hydrogen is not naturally occurring, but must be synthesized.

**No prolif and long timeframe**

Kahl ’12(Colin H. Kahl 12, security studies prof at Georgetown, senior fellow at the Center for a New American Security, was Deputy Assistant Secretary of Defense for the Middle East, “Not Time to Attack Iran”, January 17, <http://www.foreignaffairs.com/articles/137031/colin-h-kahl/not-time-to-attack-iran?page=show>

Kroenig argues that there is an urgent need to attack Iran's nuclear infrastructure soon, since Tehran could "produce its first nuclear weapon within six months of deciding to do so." Yet that last phrase is crucial. The International Atomic Energy Agency (IAEA) has documented Iranian efforts to achieve the capacity to develop nuclear weapons at some point, but there is no hard evidence that Supreme Leader Ayatollah Ali Khamenei has yet made the final decision to develop them. In arguing for a six-month horizon,Kroenig also misleadingly conflates hypothetical timelines to produce weapons-grade uranium with the time actually required to construct a bomb. According to 2010 Senate testimony by James Cartwright, then vice chairman of the U.S. Joint Chiefs of Staff, and recent statements by the former heads of Israel's national intelligence and defense intelligence agencies, even if Iran could produce enough weapons-grade uranium for a bomb in six months, it would take it at least a year to produce a testable nuclear deviceand considerably longer to make a deliverable weapon. And David Albright, president of the Institute for Science and International Security (and the source of Kroenig's six-month estimate), recently told Agence France-Presse that there is a "low probability" that the Iranians would actually develop a bomb over the next year even if they had the capability to do so. Because there is no evidence that Iran has built additional covert enrichment plants since the Natanz and Qom sites were outed in 2002 and 2009, respectively, any near-term move by Tehran to produce weapons-grade uranium would have to rely on its declared facilities. The IAEA would thus detect such activity with sufficient time for the international community to mount a forceful response. As a result, the Iranians are unlikely to commit to building nuclear weapons until they can do so much more quickly or out of sight, which could be years off.

**Unipolarity is comparatively meaningless to other factors in preventing conflict**

Legro 11 (Jeffrey W. – professor of politics and Randolph P. Compton Professor in the Miller Center at the University of Virginia, Sell unipolarity? The future of an overvalued concept in International Relations Theory and the Consequences of Unipolarity, p. EBook)

Such a view, however, is problematic. What seems increasingly clear is that the role of polarity has been *overstated* or *misunderstood* or both. This is the unavoidable conclusion that emerges from the penetrating chapters in this volume that probe America’s current dominant status (unipolarity) with the question “does the distribution of capabilities matter for patterns of international politics?”3 Despite the explicit claim that “unipolarity does have a profound impact on international politics”4 what is surprising is how *ambiguous* and *relatively limited* that influence is across the chapters. The causal impact of unipolarity has been *overvalued* for three fundamental reasons. The first is that the effects of unipolarity are often not measured relative to the influence of other causes that explain the same outcome.When the weight of *other factors* is considered, polarity seems to *pale in comparison*. Second, rather than being a structure that molds states, polarity often seems to be the productof state choice. Polarity may be *more outcome than cause*. Finally, while international structure does exist, it is constituted as much by ideational content as by material capabilities. Again polarity *loses ground in significance*.

### Hydrogen: Ext—Tech Fails

**Too many barriers to hydrogen power**

**Forbes 2013** (April 3, “Could Hydrogen Breakthrough Revive The Fuel-Cell Car?” <http://www.forbes.com/sites/jeffmcmahon/2013/04/03/could-hydrogen-breakthrough-revive-the-fuel-cell-car/>)

Mielenz predicts **Zhang’s process could reach the $100 billion hydrogen marketplace in three years**. Even if it does, Steven Chu named three more obstacles to hydrogen fuel-cell technology: “The other problem is, **if it’s for transportation, we don’t have a good storage mechanism** yet. **Compressed hydrogen** is the best mechanism [but it **requires**] **a large volume. We haven’t figured out how to store it** with high density. What else? **The fuel cells aren’t there** yet, **and the distribution infrastructure isn’t there yet. So you have four things that have to happen all at once**. And so **it always looked like it was going to be the distant future. In order to get significant deployment, you need four significant technological breakthroughs. That makes it unlikely**.”

**Hydrogen can’t compete with battery electric**

**Galas 2014** (June 7, Adam, “Why Hydrogen Fuel Cells Have No Future” <http://www.fool.com/investing/general/2014/06/07/why-hydrogen-fuel-cells-have-no-future.aspx>)

**Despite support from** these **major corporations there are two very fundamental reasons why hydrogen fuel cells will lose to battery electric** as the technology of tomorrow. **The cost of building a hydrogen infrastructure to replace petroleum and natural gas would be an estimated $200 trillion. Compare this to the cost of a smart electric grid, $338 billion to $476 billion, which would impart** $1.4 trillion to **$2 trillion in economic benefits**. **Updating our** aging electrical **grid is something that America will need to do anyway** to keep our lights on and economy running. **In the process we can help expand the existing infrastructure to accommodate electric cars which cost $0.75/gallon** equivalent to fuel, **as opposed to $4.5/gallon equivalent of hydrogen**, which the department of energy believes may drop as low as $3.75/gallon equivalent by 2020. This brings me to the second fundamental problem with fuel cells -- the fuel. **Hydrogen is not an energy source but a store of energy**, much like a battery. Today **96% of hydrogen is made from natural gas**, in a process that is 72% efficient. **Hydrogen can be made from water** in a process called electrolysis -- which is 70% efficient. However, **because it is the smallest, lightest, and least dense element hydrogen must be compressed to be stored**. **When one considers the energy losses of creating hydrogen** (say from wind or solar powered electrolysis) **then compressed into a vehicle's fuel tank, it will never be as efficient, nor as cheap, as taking that electricity and putting it straight into a battery**. **The bottom line is that EVs**, such as Tesla's Model S, **will always have the upper hand over fuel cells due to higher efficiency and lower fueling costs. Throw in the lack of hydrogen infrastructure and more expensive price tag** to build said infrastructure and **it becomes clear that hydrogen fuel cells have a very limited future, if any**.

### Hydrogen: Ext—No Iran Impact

**No impact to Iran prolif**

**Nader and Dobbins ’12** (1/5/12 – senior policy analyst at the RAND Corporation and director of the International Security and Defense Policy Center at RAND (Alireza and James, “Iran's Self-Destructive Gamble.” The New York Times. http://www.nytimes.com/2012/01/06/opinion/irans-self-destructive-gamble.html)

Iran is on the brink of losing its only real ally, Syria, as President Bashir al-Assad looks as if he could be the next Arab dictator to fall. Tightening international sanctions are slowing [Iran’s nuclear program](http://topics.nytimes.com/top/news/international/countriesandterritories/iran/nuclear_program/index.html?inline=nyt-classifier) while limiting its ability to project power. Saudi Arabia, Iran’s principal regional rival, is leading the other Gulf states in an ever more explicit anti-Iranian coalition. The United States is strengthening its military and political ties with several of these states. Iran’s leaders have watched U.S. forces topple Saddam Hussein and the Taliban with relative ease and NATO help do the same with Col. Muammar el-Qaddafi in Libya; Iran’s antiquated conventional forces are no match for the U.S. military. And the Iranian regime believes that the United States remains committed to a policy of regime change, even though Washington might not presently have the appetite for a new military intervention. Iran’s leaders believe that having a nuclear weapons capability could deter a U.S. military attack on Iran and safeguard a vulnerable regime. It is unlikely that the regime, concerned with self-preservation, will be the first party to use nuclear weapons in a conflict with the United States or Israel. The actual use of a nuclear weapon by Iran would surely lead to the regime’s ultimate end. Iran is often depicted as an irrational actor, with Ahmadinejad’s seemingly erratic behavior and odious rhetoric serving as justification. Yet the clerical-led regime in Tehran is no less rational and calculating than the former Soviet Union or Communist China, both of which were successfully deterred and contained by the United States. What’s more, the Iranian regime faces many internal and external challenges that will facilitate U.S. containment of Iran if it obtains nuclear weapons. The United States possesses the overwhelming diplomatic, economic and military power to cope with an adversary vulnerable to the very same forces that have led to the toppling of regimes across the Middle East.

### Hydrogen: Ext—No Heg Impact

**No regional rebalancing or security dilemmas—the only empirical data goes our way.**

**Fettweis 11**—Professor of PoliSci @ Tulane University [Christopher J. Fettweis, “The Superpower as Superhero: Hubris in U.S. Foreign Policy,” Paper prepared for presentation at the 2011 meeting of the American Political Science Association, September 1-4, Seattle, WA, September 2011, pg. http://ssrn.com/abstract=1902154]

The final and in some ways most important pathological belief generated by hubris places the United States at the center of the current era of relative peace. “All that stands between civility and genocide, order and mayhem,” explain Kaplan and Kristol, “is American power.”68 This belief is a variant of what is known as the “hegemonic stability theory,” which proposes that international peace is only possible when there is one country strong enough to make and enforce a set of rules.69 Although it was first developed to describe economic behavior, the theory has been applied more broadly, to explain the current proliferation of peace. At the height of PaxRomana between roughly 27 BC and 180 AD, for example, Rome was able to bring an unprecedented level of peace and security to the Mediterranean. The Pax Britannica of the nineteenth century brought a level of stability to the high seas. Perhaps the current era is peaceful because the United States has established a de facto Pax Americana in which no power is strong enough to challenge its dominance, and because it has established a set of rules that are generally in the interests of all countries to follow. Without a benevolent hegemon, some strategists fear, instability may break out around the globe.70 Unchecked conflicts could bring humanitarian disaster and, in today’s interconnected world, economic turmoil that could ripple throughout global financial markets. There are good theoretical and empirical reasons, however, to doubt that U.S hegemony is the primary cause of the current stability.¶ First, the hegemonic-stability argument shows the classic symptom of hubris: Itoverestimates the capability of the United States, in this case to maintain globalstability. No state, no matter how strong, can impose peace on determined belligerents. **The U.S. military** may be the most imposing in the history of the world, but it *can only police the system if the other members* generally *cooperate*. Self-policing must occur, in other words; if other states had not decided on their own that their interests are best served by peace, then no amount of international constabulary work by the United States could keep them from fighting. The five percent of the world’s population that lives in the United States simply cannot force peace upon an unwilling ninety-five percent. Stability and unipolarity may be simply coincidental.¶In order for U.S. hegemony to be the explanation for global stability, the rest of the world would have to expect reward for good behavior and fear punishment for bad. Since the end of the Cold War, the United States has not been especially eager to enforce any particular rules. Even rather incontrovertible evidence of genocide has not been enough to inspire action. Hegemonic stability can only take credit for influencing those decisions that would have ended in war without the presence, whether physical or psychological, of the United States. Since most of the world today is free to fight without U.S. involvement, something else must be preventing them from doing so.71 Stability exists in many places where no hegemony is present. Ethiopia and Eritrea are hardly the only states that could go to war without the slightest threat of U.S. intervention, yet few choose to do so.¶ Second, it is worthwhile to repeat one of the most basic observations about misperception in international politics, one that is magnified by hubris: Rarely are our actions as consequential upon their behavior as we believe them to be. The ego-centric bias suggests that while it may be natural for U.S. policymakers to interpret their role as crucial in the maintenance of world peace, they are almost certainly overestimating their own importance. At the very least, the United States is probably not as central to the myriad decisions in foreign capitals that help maintain international stability as it thinks it is.¶ Third, if U.S. security guarantees were the primary cause of the restraintshown by the other great and potentially great powers, then those countries would be demonstrating an amount of **trust** in the intentions, judgment and wisdom of another that would be **without precedent in** international **history**. If the states of Europe and the Pacific Rim detected a good deal of danger in the system, relying entirely on the generosity and sagacity (or, perhaps the naiveté and gullibility) of Washington would be the height of strategic irresponsibility. Indeed it is hard to think of a similar choice: When have any capable members of an alliance virtually disarmed and allowed another member to protect their interests? It seems more logical to suggest thattheother members of NATO and Japan just *do not share the same perception of threat*that the United States does. If there was danger out there, as so many in the U.S. national security community insist, then the grand strategies of the allies would be quite different. Even during the Cold War, U.S. allies were not always convinced that they could rely on U.S. security commitments. Extended deterrence was never entirely comforting; few Europeans could be sure that United States would indeed sacrifice New York for Hamburg. In the absence of the unifying Soviet threat, their trust in U.S. commitments for their defense would presumably be lower—if in fact that commitment was at all necessary outside of the most pessimistic works of fiction.¶ Furthermore, in order for hegemonic stability logic to be an adequate explanation for restrained behavior, allied statesmust not only be fully convinced of the intentions and capability of the hegemon to protect their interests; they must also trust that the hegemon can interpret those interests correctly and consistently. As discussed above, the allies do not feel that the United States consistently demonstrates the highest level of strategic wisdom. In fact, they often seem to look with confused eyes upon our behavior, and are unable to explain why we so often find it necessary to go abroad in search of monsters to destroy. They will participate at times in our adventures, but minimally and reluctantly.¶Finally, while believers in hegemonic stability as the primary explanation for the long peace have articulated a logic that some find compelling, they are rarely able to cite much evidence to support their claims. In fact, *the* limited *empirical data* we have suggests that there is little connection between the relative level of U.S. activism and international stability. During the 1990s, the United States cut back on defense fairly substantially, spending $100 billion less in real terms in 1998 that it did in 1990, which was a twenty-five percent reduction.72 To defense hawks and other believers in hegemonic stability, this irresponsible “peace dividend” endangered both national and global security. “No serious analyst of American military capabilities doubts that the defense budget has been cut much too far to meet America’s responsibilities to itself and to world peace,” argued Kristol and Kagan.”73 If global stability were unrelated to U.S. hegemony, however, one would not have expected an increase in conflict and violence.¶ The verdict from the last two decades is fairly plain: The world grew more peaceful while the United States cut its forces.74 No state believed that its security was endangered by a less-capable U.S. military, or at least none took any action that would suggest such a belief. **No defense establishments were enhanced** to address power vacuums;**no security dilemmas drove insecurity or arms races; no regional balancing occurred** after the stabilizing presence of the U.S. military was diminished. The rest of the world acted as if the threat of international war was not a pressing concern, despite the reduction in U.S. capabilities. The incidence and magnitude of global conflict declined while the United States cut its military spending under President Clinton, and kept declining as the Bush Administration ramped that spending back up. The two phenomena are unrelated.¶These figures will not be enough to convince skeptics. Military spending figures by themselves are insufficient to disprove a connection between overall U.S. actions and international stability, and one could also presumably argue that spending is not the only or even the best indication of hegemony, that it is instead U.S. foreign political and security commitments that maintain stability. Since neither was significantly altered during this period, instability should not be expected. Alternately, advocates of hegemonic stability could believe that relative rather than absolute spending is decisive in bringing peace. Although the United States cut back on its spending during the 1990s, its relative advantage never wavered.¶ However, two points deserve to be made. First, even if it were true that either U.S. commitments or relative spending account for global pacific trends, it would remain the case that stability can be maintained at drastically lower levels. In other words, even if one can be allowed to argue in the alternative for a moment and suppose that there is in fact a level of engagement below which the United States cannot drop without increasing international disorder, a rational grand strategist would still cut back on engagement and spending until that level is determined. Basic logic suggests that the United States ought to spend the minimum amount of its blood and treasure while seeking the maximum return on its investment. And if, as many suspect, this era of global peace proves to be inherently stable because normative evolution is typically unidirectional, then no increase in conflict would ever occur, irrespective of U.S. spending.75 Abandoning the mission to stabilize the world would save untold trillions for an increasingly debt-ridden nation.¶ Second, it is also worth noting that if opposite trends had unfolded, if other states had reacted to news of cuts in U.S. defense spending with more aggressive or insecure behavior, then surely hegemonists would note that their expectations had been justified. If increases in conflict would have been interpreted as evidence for the wisdom of internationalist strategies, then logical consistency demands that the lack thereof should at least pose a problem. As it stands, the only evidence we have regarding the relationship between U.S. power and international stability suggests that *the two are unrelated*. Evidently the rest of the world can operate quite effectively without the presence of a global policeman. Those who think otherwise base their view on *faith alone*.¶It requires a good deal of hubris for any actor to consider itself indispensable to world peace. Far from collapsing into a whirlwind of chaos, the chances are high that the world would look much like it does now if the United States were to cease regarding itself as God’s gladiator on earth. The people of the United States would be a lot better off as well.

## Adv: Warming

### Warming: 1NC

**OTEC plants harm marine organisms specifically plankton**

Comfort and Vega 11

Christina M. Comfort and Luis Vega, Ph.D.

Hawaii National Marine Renewable Energy Center Hawaii Natural Energy Institute University of Hawaii at Manoa “Environmental Assessment of Ocean Thermal Energy Conversion in Hawaii: Available data and a protocol for baseline monitoring” Aug 2011

<http://hinmrec.hnei.hawaii.edu/wp-content/uploads/2010/01/Environmental-Assessment-of-OTEC-in-Hawaii1.pdf>

As with any offshore operation, the **plant is likely to attract fish and seabirds**, **noise may interfere with animal communication**, and **lubricants or anti-biofouling chemicals may enter the ocean**. Specifically concerning OTEC, the redistribution of millions of cubic meters of water per day will change stratification, salinity, oxygen, and nutrient levels near the site. Some organisms base their behavior on certain temperature or salinity gradients, e.g. [10], while others may be affected by increased nutrient levels [18]. Additionally, **plankton and small nekton will be entrained in the water flow** in both the shallow and deep intake pipes, and **will likely suffer high mortality rates due to rapid temperature and pressure changes** [4]. Organisms could be impinged against screens on the shallow water intakes if their burst swimming capacity does not overcome the current generated by the pipe [2, 3].

**Protecting current levels of the plankton population is key to slowing global warming**

Reid et al 10

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UK Department for Environment Food and Rural Affairs

“The Healthy and Biologically Diverse Seas Feeder Report”

<http://chartingprogress.defra.gov.uk/feeder/HBDSEG-FeederReport-sec3_3.pdf>

Through their production, plankton determine the carrying capacity of ecosystems around the British Isles. The sustainable exploitation of living marine resources is dependent on this factor and its variability from year-to-year. Plankton and their breakdown products are intrinsically linked to the cycling of matter through different biogeochemical cycles. Phytoplankton may at times occur in huge concentrations (blooms) that may in part be due to increased human inputs of nutrients to the sea (eutrophication). Some of the species are toxic to humans and other marine animals, while others may cause mortalities of farmed fish or benthos due to oxygen depletion during bloom die-offs; these are termed ‘harmful algal blooms’ (HABs). **Phytoplankton** also **play a key role in modulating climate change** through a range of interactions, including the formation of biogenic aerosols such as dimethylsulphide (DMS). **A key phytoplankton process is the photosynthetic uptake of carbon dioxide (CO2) in the surface ocean and its export as organic and inorganic carbon to the deep ocean in what is termed the ‘biological carbon pump**’. Grazing and recycling of nutrients by zooplankton and bacteria, including reprocessing and packaging of planktonic detrital material as it sinks through the water column, are key processes in determining the export rate of carbon (C) fixed by primary production (Steinberg et al., 2008). At the surface, **during phytoplankton growth**, concentrations of CO2 are generally less than the equilibrium level with the atmosphere and as a consequence **CO2 enters the ocean from the atmosphere**. While some of this organic carbon will be returned by *in situ* respiration in the water column, some will sink to the seabed. The deep bottom waters of the oceans, because of their colder temperature, can hold much higher concentrations of CO2 and dissolved organic matter from settling plankton than surface waters. **Without** this deep reservoir **concentrations of CO2** in the atmosphere **would be much higher.** The distribution, abundance, production and biodiversity of different plankton species / groups are likely to be profoundly affected by projected climate-driven changes in the physical and chemical properties of the ocean including circulation, stratification, nutrients, light, trace metals (e.g. iron) and carbonate chemistry. Such changes are likely to be compounded by the effects of ocean acidification on all plankton groups and especially those species that have calcareous body parts. The converse is also likely to occur as changes in plankton ecology and biodiversity could have a large and rapid impact with important feedbacks to climate variability through their role in the Biological, Continental Shelf and Carbonate carbon pumps (Reid et al., 2009a). Any **substantial** global **change in the composition or functioning of plankton ecosystems** thus **has considerable implications for climate change.** As the food source for living marine resources, the composition, variability in production and timing of occurrence of plankton can greatly impact the tonnage of harvestable fish and shellfish. **Without plankton there would be no fish in the sea.** However, since phytoplankton process nutrient inputs to the sea, increased nutrient levels may promote eutrophication. Through their harmful effects, algal blooms can therefore have a profound economic impact on aquaculture, both through direct effects and by changing the buying preferences of the public through negative media publicity associated with HABs. As indicators of eutrophication, excessive and prolonged growth of phytoplankton may have a large economic consequence through a requirement to construct improved sewage systems and reduce agricultural inputs of nutrients to the sea. Perhaps the greatest socioeconomic impact, but as yet unquantified, is the role that plankton play in ameliorating or increasing the rate of global warming through negative and positive feedbacks to atmospheric greenhouse gases. Information to help determine this role is not available at present as the necessary monitoring to determine plankton variability and its contribution to atmospheric levels of CO2 at a UK regional and global scale does not exist.

**No impact – empirics**

**Willis et. al, ’10** [Kathy J. Willis, Keith D. Bennett, Shonil A. Bhagwat & H. John B. Birks (2010): 4 °C and beyond: what did this mean for biodiversity in the past?, Systematics and Biodiversity, 8:1, 3-9, <http://www.tandfonline.com/doi/pdf/10.1080/14772000903495833>, ]

**The most recent climate models and fossil evidence for the early Eocene Climatic Optimum** (53–51 million years ago) **indicate that during this time interval atmospheric CO2 would have exceeded 1200 ppmv and tropical temperatures were between 5–10 ◦ C warmer than modern values** (Zachos et al., 2008). **There is** also **evidence for relatively rapid intervals of extreme global warmth and massive carbon addition when global temperatures increased by 5 ◦ C in less than 10 000 years** (Zachos et al., 2001). So **what was the response of biota to these ‘climate extremes’ and do we see the large-scale extinctions** (especially in the Neotropics) **predicted by some of the most recent models associated with future climate changes** (Huntingford et al., 2008)? In fact **the fossil record for the early Eocene Climatic Optimum demonstrates the very opposite.** All the evidence from low-latitude records indicates that, **at least in the plant fossil record, this was one of the most biodiverse intervals of time in the Neotropics** (Jaramillo et al., 2006). It was also a time when **the tropical forest biome was the most extensive in Earth’s history, extending to mid-latitudes in both the northern and southern hemispheres – and there was also no ice at the Poles and Antarctica was covered by needle-leaved forest** (Morley, 2007). **There were certainly novel ecosystems, and an increase in community turnover with a mixture of tropical and temperate species in mid latitudes and plants persisting in areas that are currently polar deserts**. [It should be noted; however, that **at the earlier Palaeocene–Eocene Thermal Maximum (PETM) at 55.8 million years ago in the US Gulf Coast, there was a rapid vegetation response to climate change**. There was major compositional turnover, palynological richness decreased, and regional extinctions occurred (Harrington & Jaramillo, 2007). Reasons for these changes are unclear, but they may have resulted from continental drying, negative feedbacks on vegetation to changing CO2 (assuming that CO2 changed during the PETM), rapid cooling immediately after the PETM, or subtle changes in plant–animal interactions (Harrington & Jaramillo, 2007).]

**Growing emissions in developing countries make CO2 reduction impossible – modeling is irrelevant**

**Koetzle, 08** – Ph.D. and Senior Vice President of Public Policy at the Institute for Energy Research (William, “IER Rebuttal to Boucher White Paper”, 4/13/2008, http://www.instituteforenergyresearch.org/2008/04/13/ier-rebuttal-to-boucher-white-paper/)

For example, if the United States were to unilaterally reduced emissions by 30% or 40% below 2004 levels[8] by 2030; net global CO2 emissions would still increase by more than 40%. The reason is straightforward: either of these reduction levels is offset by the increases in CO2 emissions in developing countries. For example, a 30% cut below 2004 levels by 2030 by the United States offsets less than 60% of China’s increase in emissions during the same period. In fact, even **if the United States were to eliminate all CO2 emissions by 2030, without any corresponding actions by other countries, world-wide emissions would still increase by 30%. If the United States were joined by the other OECD countries in a CO2 reduction effort, net emissions would still significantly increase.** In the event of an OCED-wide reduction of 30%, global emissions increase by 33%; a reduction of 40% still leads to a net increase of just under 30%. Simply put, in order to hold CO2 emissions at 2004 levels, absent any reductions by developing nations like China and India, all OECD emissions would have to cease.[9] **The lack of participation by all significant sources of GHGs not only means it is unlikely that net reductions will occur; it also means that the cost of meaningful reductions is increased dramatically.** Nordhous (2007) for example, argues that for the “importance of near-universal participation to reduce greenhouse gases.”[10] His analysis shows that GHG emission reduction plans that include, for example, **50% of world-wide emissions impose additional costs of 250 percent.** Thus, he find’s GHG abatement plans like Kyoto (which does not include significant emitters like the United States, China, and India) to be “seriously flawed” and “likely to be ineffective.” [11] Even if the United States had participated, he argues that Kyoto would make “but a small contribution to slowing global warming, and it would continue to be highly inefficient.”[12]The data on emissions and economic analysis of reduction programs make it clear that GHG emissions are a global issue. **Actions by localities, sectors, states, regions or even nations are unlikely to effectively reduce net global emissions unless these reductions are to a large extent mirrored by all significant emitting nations.**

### Warming: Ext—No Impact

**Framing issue – their evidence is speculative on the effect of warming – prefer historical analysis in determining warming –**

**Willis, et. al, ‘10** [Kathy J. Willis, Keith D. Bennett, Shonil A. Bhagwat & H. John B. Birks (2010): 4 °C and beyond: what did this mean for biodiversity in the past?, Systematics and Biodiversity, 8:1, 3-9, <http://www.tandfonline.com/doi/pdf/10.1080/14772000903495833>, ]

So **why is there this discrepancy between what the fossil and historical records** are **tell**ing **us about extinctions driven by climate change and those predicted through models**? **Many biota,** using evidence from fossil plant records, **likely have much wider ecological tolerances than are usually assigned in models**. Also, **the present-day distribution of species, especially in mid to high latitudes, often has a strong historical/pre-historical cultural imprint** (e.g. Bradshaw & Lindbladh, 2005) **which again is often not taken into account in the models**. However, **the discrepancy is also in part due to the coarse scale of the models used to estimate climate change-induced habitat loss**. For example, **a recent study to assess whether climate change-induced habitat losses predicted at the European scale** (16 km × 16 km grid cells) **are also predicted from local-scale data and modelling** (25 m × 25 m grid cells) in two regions of the Swiss Alps **indicated that whereas the European-scale model predict loss of all suitable habitats, local-scale models predict persistence of suitable habitats in up to 100% of species** (Randin et al., 2009). **A similar conclusion was also reached in a study to assess the predictive accuracy of bioclimatic envelope models for the future distribution of European butterﬂies** (Luoto & Heikkinen, 2008). Here, **of the 100 species studied, a model that included topography predicted only half of the species losses for the period 2051–2080 compared with those predicted by a climate-only model**. In contrast, the number of species predicted to disappear from ﬂatlands doubled. **It would appear from both these studies that habitat heterogeneity resulting from topographic diversity may be an essential factor for persistence of biota in a future changing climate** (Willis & Bhagwat, 2009). Based on these studies, and many others using fossil and historical records, we argue that **evidence for the widely cited view that future climate change poses an equal or greater threat to global biodiversity than anthropogenic land-use change and habitat loss** (Thomas et al., 2004) **is** **equivocal:** extinctions driven by the latter processes of habitat loss pose a far greater threat to global biodiversity. It is also questionable, however, whether it is even possible to now separate the two processes, given that over 80% of the Earth’s terrestrial biomes now have evidence of an anthropogenic impact upon them (Ellis & Ramankutty, 2008). What we probably need to be considering is the synergistic effect of these two factors on biodiversity (Travis, 2003)

**Ecosystems will adapt – no impact**

**Center for the Study of Carbon Dioxide and Global Change** - Archived 8 March **’11**, Surviving the Unprecedented Climate Change of the IPCC, http://www.nipccreport.org/articles/2011/mar/8mar2011a5.html

(Citing: Willis, K.J., Bennett, K.D., Bhagwat, S.A. and Birks, H.J.B. 2010. 4°C and beyond: what did this mean for biodiversity in the past? Systematics and Biodiversity 8: 3-9.)

In a paper published in Systematics and Biodiversity, Willis et al. (2010) consider the IPCC (2007) "predicted climatic changes for the next century" -- i.e., their contentions that "global temperatures will increase by 2-4°C and possibly beyond, sea levels will rise (~1 m ± 0.5 m), and atmospheric CO2 will increase by up to 1000 ppm" -- noting that it is "widely suggested that the magnitude and rate of these changes will result in many plants and animals going extinct," citing studies that suggest that "within the next century, over 35% of some biota will have gone extinct (Thomas et al., 2004; Solomon et al., 2007) and there will be extensive die-back of the tropical rainforest due to climate change (e.g. Huntingford et al., 2008)." On the other hand, they indicate that some **biologists and climatologists have pointed out that "many of the predicted increases in climate have happened before, in terms of both magnitude and rate of change** (e.g. Royer, 2008; Zachos et al., 2008), **and yet biotic communities have remained remarkably resilient** (Mayle and Power, 2008) **and in some cases thrived** (Svenning and Condit, 2008)." But they report that those who mention these things are often "placed in the 'climate-change denier' category," although the purpose for pointing out these facts is simply to present "a sound scientific basis for understanding biotic responses to the magnitudes and rates of climate change predicted for the future through using the vast data resource that we can exploit in fossil records." Going on to do just that, **Willis et al. focus on "intervals in time in the fossil record when atmospheric CO2 concentrations increased up to 1200 ppm, temperatures in mid- to high-latitudes increased by greater than 4°C within 60 years, and sea levels rose by up to 3 m higher than present**," describing studies of past biotic responses that indicate "the scale and impact of the magnitude and rate of such climate changes on biodiversity." And **what emerges from those studies**, as they describe it, "**is evidence for rapid community turnover, migrations, development of novel ecosystems and thresholds from one stable ecosystem state to another**." And, most importantly in this regard, they report "**there is very little evidence for broad-scale extinctions due to a warming world."** In concluding, **the Norwegian, Swedish and UK researchers say that "based on such evidence we urge some caution in assuming broad-scale extinctions of species will occur due solely to climate changes of the magnitude and rate predicted for the next century**," reiterating that "**the fossil record indicates remarkable biotic resilience to wide amplitude fluctuations in climate."**

**Their studies prove the existence of warming, not the impact – doomsday predictions are empirically denied and ignore scientists**

John **Stossel**, Award-winning ABC News correspondent, **2007**

The Global Warming Myth?, http://abcnews.go.com/2020/Story?id=3061015&page=1

Dr. John **Christy**, **professor of Atmospheric Science at** the **U**niversity of **Alabama** at Huntsville **said**: "I remember as a college student at the first Earth Day being told it was a certainty that by the year 2000, the world would be starving and out of energy. Such **doomsday prophecies grabbed headlines, but have** **proven to be completely false."** "Similar **pronouncements today about catastrophes due to human-induced climate change,"** he continued, **"sound all too familiar and** **all too exaggerated** to me **as someone who actually produces and analyzes climate information."** The media, of course, like the **exaggerated claims**. Most **are based on computer models that purport to predict future climates. But computer models are** **lousy at predicting climate** **because water vapor and cloud effects cause changes that computers fail to predict**. In the mid-1970s, computer models told us we should prepare for global cooling. **Scientists tell reporters that computer models should "be viewed with great skepticism."** Well, why aren't they? The fundamentalist **doom mongers** also **ignore scientists who say the effects of global warming may be benign. Harvard astrophysicist** Sallie **Baliunas said** **added CO2** in the atmosphere **may actually benefit the world** **because more CO2 helps plants grow**. Warmer winters would give farmers a longer harvest season, and might end the droughts in the Sahara Desert. **Why don't we hear about this part of the global warming argument? "It's the money!"** said Dr. Baliunas. **"Twenty-five billion dollars in government funding has been spent since 1990 to research global warming. If scientists and researchers were coming out releasing reports that global warming has little to do with man, and most to do with just how the planet works, there wouldn't be as much money to study it."**

## Solvency

### Solvency: 1NC

**1. OTEC fails – requires large temperature differences that are rare around the US**

**Combs 8** (Susan, Texas Comptroller of Public Accounts, The Energy Report 2008, <http://www.window.state.tx.us/specialrpt/energy/pdf/20-OceanPower.pdf>, May 2008)

Finally, ocean thermal energy conversion (**OTEC)¶ is the least accessible form of ocean power, and¶ perhaps the least useful for the U.S.** **To work,¶ OTEC needs an optimal temperature diff erence¶ between warm water on the surface and colder¶ water below of about 36°F—a range found only in¶ tropical coastal areas near the equator**. In the U.S.,¶ OTEC research and testing is taking place in¶ Hawaii. Th e cold water is brought to the surface¶ by a deeply submerged intake pipe.¶ Researchers have developed two diff erent types¶ of OTEC and a third that is a hybrid of the other¶ two; all use the thermal energy stored in seawater¶ to power a steam turbine. Closed-cycle OTEC uses¶ warm seawater to vaporize a low-boiling point¶ liquid that then drives a turbine to generate electricity.¶ (Th is approach is similar to the binary cycle¶ method of geothermal generation.) Th e vaporized¶ liquid then is cooled and condensed back to liquid¶ with cold seawater, and the cycle repeats. Open-cycle¶ OTEC gets warm seawater to boil through lowered¶ pressure and uses the resulting steam to drive the¶ turbine. Once again, cold water from the deep converts¶ the steam back to (now desalinated) water.¶ Th e hybrid method uses the steam from boiled seawater¶ to vaporize a low-boiling point liquid, which¶ then drives the turbine.11 In concept, these systems¶ are quite simple, but in practice the **depths and¶ scale that are required to eff ectively harness¶ OTEC have been prohibitive.**

**2. Costs, risks, and lack of public support prevent OTEC success**

**Friedman 14** (Becca, UC Berkeley, Graduate School of Journalism, “Examining the future of Ocean Thermal Energy Conversion,” source from Harvard Political Review, Ocean Energy Council, 03/14, <http://www.oceanenergycouncil.com/examining-future-ocean-thermal-energy-conversion/>)

Despite the sound science, a **fully functioning OTEC prototype has yet to be developed**. The **high costs of building even a model pose the main barrie**r. Although piecemeal experiments have proven the effectiveness of the individual components, a **large-scale plant has never been built**. Luis Vega of the Pacific International Center for High Technology Research estimated in an OTEC summary presentation that a commercial-size five-megawatt **OTEC plant** could **cost** from **80 to 100 million dollars** over five years. According to Terry Penney, the Technology Manager at the National Renewable Energy Laboratory, the combination of **cost and risk is OTEC’s main liability**. “We’ve talked to inventors and other constituents over the years, and **it’s still a matter of huge capital investment and a huge risk, and there are many [alternate forms of energy] that are less risky that could produce power with the same certainty,”** Penney told the HPR.¶ Moreover, **OTEC is highly vulnerable to the elements in the marine environment.** **Big storms or a hurricane like Katrina could completely disrupt energy production by mangling the OTEC plants**. Were a country completely dependent on oceanic energy, **severe weather could be debilitating**. In addition, there is a risk that the **salt water surrounding an OTEC plant would cause the machinery to “rust or corrode” or “fill up with seaweed or mud**,” according to a National Renewable Energy Laboratory spokesman.¶ Even **environmentalists have impeded OTEC’s development**. According to Penney, **people do not want to see OTEC plants when they look at the ocean**. When they see a disruption of the pristine marine landscape, they think pollution.

**3. Storms and tech issues prevent OTEC development**

**Coastal Response Research Center 9** (The Coastal Response Research Center, a partnership between the National¶ Oceanic and Atmospheric Administration (NOAA) Office of Response and Restoration¶ (ORR) and the University of New Hampshire (UNH), develops new approaches to¶ marine environmental response and restoration through research and synthesis of¶ information. In 2009, the center partnered with NOAA’s Office of Ocean and Coastal¶ Resource Management (OCRM) to host a series of workshops to gather information¶ about Ocean Thermal Energy Conversion (OTEC)., “Technical Readiness of¶ Ocean Thermal Energy Conversion (OTEC),” November 3 – 5, 2009, <http://coastalmanagement.noaa.gov/otec/docs/otectech1109.pdf>)

One of the most important challenges with the platform mooring is preventing **marine fouling of the mooring line and hardware**. Excessive fouling may **impact the integrity of the mooring lines, and increase drag resulting in higher loading**. Most platform moorings are near shore, while **OTEC platforms are likely to be in very deep water** **and are exposed to high sea conditions, which may present design challenges.** **Another significant challenge will be the requirement to disconnect and recover the moorings in case of extreme storms. Mobilization and deployment were identified as the riskiest part of the platform mooring life cycle. Potential issues include: inability to deploy effectively and safely, significant delay in startup, additional costs, or complete system failure. Cost drivers include need for spare components, site conditions, weather, water depth, installation complexity, material costs, performance requirements, installation risk and insurance, labor costs, permitting and regulations, removal and decommissioning costs and requirements.** Cost savings could be realized through mooring optimization (single point vs. multipoint), coordination and optimization of platform design, less stringent motion and survivability requirements, citing, mitigating high cost factors, and the ability to self-install.

**4. Biofouling will destroy OTEC**

**Satpathy et al. 10** (from Environmental and Industrial Safety Section, Indira Gandhi Centre for Atomic Research, Loyola Institute of Frontier Energy, “Biofouling and its control in¶ seawater cooled power plant¶ cooling water system - a review,” [www.intechopen.com](http://www.intechopen.com), <http://www.intechopen.com/books/nuclear-power/biofouling-and-its-control-in-seawater-cooled-power-plant-cooling-water-system-a-review->, 08/17/10)

Biofouling may be defined as the attachment and subsequent growth of a community of¶ usually visible plants and animals on manmade structures exposed to seawater¶ environment. **Man has long been aware of this problem.** In the fourth century B.C., Aristotle¶ is reported to have stated that small “fish” (barnacles) were able to slow down ships.¶ Fouling of ship hulls, navigational buoys, underwater equipment, seawater piping systems,¶ industrial or municipal intakes, beach well structures, oil rigs and allied structures has often¶ been reported. In the past few decades, the list of affected structures has expanded. Now,¶ **reports are common regarding the biofouling that affects** Ocean Thermal Energy Conversion¶ **(OTEC)** plants, offshore platforms, moored oceanographic instruments and nuclear and¶ other submarines. The impact of biofouling on sea front structures is staggering. **Ships show¶ a 10% higher fuel consumption caused by increased drag and frictional resistance** resulting¶ from hull and propeller fouling. **Water lines lose their carrying capacity and speed of flow**¶ owing to biofouling growth along pipe systems. The **heat exchanger performance declines¶** due to attachment of biofoulants. Many marine organisms themselves face the constant¶ problem of being colonized and overgrown by fouling organisms. Immobile plants and¶ animals are generally exposed to biofouling and consequent loss of species and community¶ assemblages. **Biofouling also promotes corrosion of materials**. The **money and material¶ needed for fouling protection measures are indeed exorbitant.** It is estimated that the **marine¶ industry incurs an expenditure of 10 billion sterling pounds a year to combat the situations¶** arising from biofouling worldwide (Satpathy, 1990). A lot of research effort has been¶ devoted to understand the fundamental ecology and biology of fouling environments,¶ organisms and communities in diverse settings.¶ The huge requirement of cooling water as well as accrescent demand on the freshwater has¶ led to the natural choice for locating power plants in the coastal sites where water is¶ available in copious amount at relatively cheap rate. For example, a 500 MW (e) nuclear¶ power plant uses about 30 m3sec-1 of cooling water for extracting heat from the condenser¶ and other auxiliary heat exchanger systems for efficient operation of the plant. However,¶ use of seawater, brings associated problems such as colonization of biota which stands in¶ the way of smooth operation of the plant. Unfortunately, every cooling system with its¶ concrete walls forms a suitable substrate for marine growth. Some of the conditions which¶ favour the development of a fouling community in power plants are (a) continuous flow of¶ seawater rich in oxygen & food, (b) reduction in silt deposition, (c) lack of competition from¶ other communities and (d) reduction in the density of predators. Broadly speaking the¶ **effects of marine growth on the power plant are (a) losses in plant efficiency, (b) mechanical¶ damage** and (c) problem for the integrity of the cooling circuits needed for safety of nuclear¶ plants (Nair, 1987). Hence biofouling control aims to achieve efficient operation of the¶ power station at all times. It is therefore necessary for power plant designers to make a¶ rational choice regarding the most suitable control method to combat biofouling problem in¶ a practical, yet economically feasible & environmentally acceptable manner.

**5. Poor licensing process prevents OTEC development**

Combs 8 (Susan Combs, The Energy Report: Texas Comptroller of Public Accounts May 2008, http://www.window.state.tx.us/specialrpt/energy/pdf/20-OceanPower.pdf)

Ocean power generation falls under the Federal¶ Energy Regulatory Commission’s (FERC)¶ jurisdiction. **Because the technology is so new**,¶ however, **applications for pilot projects have been¶ anything but routine**, with companies asking¶ for waivers of some licensing requirements. In¶ particular, **the applications require some data that¶ cannot be gathered without installing and operating¶ the devices**.¶ In 2005, FERC granted limited licensing exceptions¶ for pilot projects, one in New¶ York, and preliminary permits for the study of potential¶ sites off the Florida coast. The commission¶ also began to streamline its process for permitting¶ ocean power projects.21 **State regulations** for such¶ facilities **are similarly immature and are likely to¶ be drawn from existing laws governing conventional¶ power plants** and electricity transmission.

### Solvency: Ext—Ocean Depth

#### OTEC unfeasible – not enough proper sites in the US for it, and too expensive

Crews, 97(Richard Crews, financial specialist and writer, 12/28/97, “OTEC Sites,” http://www.trellis.demon.co.uk/reports/otec\_sites.html)

**An OTEC facility requires** a **substantial** initial **capital** outlay (in the range of **$50 to $100 million for a “small”** ten-megawatt **plant**). **OTEC has not been demonstrated at full scale** over a prolonged period with integrated power, mariculture, fresh-water, and chill-water production. **OTEC is only feasible at relatively isolated sites (deep tropical oceans)**; from such sites, the power and marine products must be transported to market. (In general, the **fresh water--and certainly the chill-water--cannot be transported more than a few miles economically**.) **OTEC is ecologically controversial**--at least untested--in large scale and over a long period.

### Solvency: Ext—Cost

**Costs inhibit OTEC from being a viable market option**

**Choi**, writer for Live Science, **8** (Charles Q. Choi, 12/12/08, “The Energy Debates: Ocean Thermal Energy Conversion,” Live Science, http://www.livescience.com/3155-energy-debates-ocean-thermal-energy-conversion.html, Terry Penney is a lab program manager at the National Renewable Energy Laboratory in Golden, Colorado.)

**Ocean thermal energy conversion requires a lot of money up front since the devices are massive undertakings,** Penney explained. **The pipes have to be wide or else the deep seawater rushes up too fast, heating up as it rubs against the sides — an intolerable consequence**, since it needs to be cold. **To get the cold water necessary, the pipes also have to extend down thousands of feet.** **Keeping the plants operating in the face of the corrosive saltwater environment and organic matter that inevitably clogs up the works could prove challenging also.** "**And for all that investment, you don't know if two months after you deploy it whether a tropical storm will then wipe it out,"** Penney said. Still, "the oil industry clearly knows how to put structures in place in the ocean and drill down to 15,000 feet. The technology is there — it could just be very costly." **The environmental impact of OTEC remains** **murky**. While nutrients in cold water from the deep could help aquaculture farms prosper, one question is whether they might also help unwanted life to grow as well. "And **if you're pumping up billions of gallons from the depths, what might it change there?**" Penney asked. **"There's life down there too."**

#### Building a OTEC plant isn’t financially sound due to high overhead costs.

**Economist ‘12(**January 7. “Second time around…”http://www.economist.com/node/21542381)

EVEN by the standards of American bureaucracy, an organisation that operated for 13 years without achieving anything is impressive. Yet that was the fate of the Ocean Thermal Energy Conversion (OTEC) permit office, which opened its doors in 1981 and closed them in 1994, having issued not a single OTEC permit.¶ The office was part of NOAA, America's National Oceanic and Atmospheric Administration—a marine counterpart of the country's space agency, NASA. And the idea of OTEC was to exploit the difference in temperature between the top of the ocean and the bottom, in order to drive turbines and generate electricity. The incentive was the oil-price spike of the 1970s. But once that incentive went away, so did interest in alternative sources of power and, eventually, so too did the office.¶ Alternative power sources are back in fashion, though, and OTEC is one of them. A range of companies, from giants such as Lockheed Martin to minnows like the Ocean Thermal Energy Corporation of Lancaster, Pennsylvania, are working on the technology, and this time it might actually come to pass. Most of the bits and pieces required can be borrowed from other areas of engineering, such as deepwater oil drilling. And the idea of a power station whose fuel is free is attractive, as long as the capital cost is not too high.¶ The most common OTEC design uses a fluid with a low boiling point—typically ammonia—which circulates through a network of pipes. First, it is vaporised in a heat exchanger that is warmed by surface water with a temperature of around 25°C. That puts the gas under sufficient pressure to spin a turbine and thus generate electricity. When it has done so, the gas is sent to a second heat exchanger, where it is cooled by seawater that has been pumped from a depth of a kilometre or so, where the temperature is about 5°C. That condenses it back into a liquid, and the whole process can be repeated. Theoretically, then, an OTEC plant can be built anywhere that the ocean has a surface temperature above 25°C and is more than 1km deep.¶ Fortunately for the technology's supporters, that state of affairs pertains in several places of interest to America's Defence Department. These include Guam, in the Pacific Ocean, and Diego Garcia, in the Indian Ocean. Both islands host American bases, and even in these straitened times the Pentagon's budget can stretch to an experimental technology that might reduce a base's fuel consumption.¶ The actual experiment, though, is on Hawaii, where Lockheed is collaborating with a smaller firm, Makai Ocean Engineering, to build a ten megawatt (MW) pilot plant that should be operational by 2015. If that goes well, the idea is to follow it with a 100MW power station by 2020.¶ For this, however, a new piece of kit will be needed. The heat exchangers and pipework required to make a 10MW plant already exist, but the 100MW facility will need a pipe that is not only 1km long (in order to reach the cold water at depth) but ten metres in diameter (in order to bring enough of that cold water to the surface). This is quite some pipe, and it will also have to be rugged enough to survive for decades in the open ocean. Nor will it be cheap. Kerry Kehoe, the current head of OTEC activities at NOAA, estimates such a facility could cost $1 billion.¶ A more modest project is planned by the Ocean Thermal Energy Corporation. It has signed a memorandum of understanding with the Bahamian government to build a fully commercial OTEC plant. Initially, cold water will be pumped from the ocean depths to provide cooling for a holiday resort—a project that will cost $100m. Eventually, the plan is to turn this into a full-fledged 10MW power station. Bolting cooling facilities onto an OTEC generator, and also using some of the resulting power for desalination on islands like the Bahamas that are short of fresh water, helps tip the economic balance in favour of OTEC.¶ The Caribbean, indeed, seems a popular place to try the technology out. The first OTEC plant, built in 1930, was at Matanzas Bay, just across the Florida straits from the Bahamas, in Cuba. That successfully produced 22kW, though it was eventually destroyed by wind and waves. A mere eight decades later, the technology may at last come to fruition.

### Solvency: Ext—Tech Issues/Storms

**Possible complications with equipment would prove detrimental**

**Finney**, Environmental and Water Resource Analyst, **8** (Karen Anne Finney, “Ocean Thermal Energy Conversion,” Guelph Engineering Journal, http://www.soe.uoguelph.ca/webfiles/gej/articles/GEJ\_001-017-023\_Finney\_Ocean\_Thermal\_Energy.pdf)

Because the warm seawater is flash evaporated, it becomes desalinated and becomes pure fresh water. This is a major advantage to this type of system as it can provide fresh water to communities who are in shortage. Another major advantage is the fact that the working fluid is not a potential threat to the environment. However **there are several disadvantages to this type of system.** The first one being that **the system must be carefully sealed to prevent leakage into the system of atmospheric air. This would be detrimental** to the systemas it relies completely on the pressure gradientto flash evaporate the warm seawater**. The second disadvantage is that the volume of working fluid required is much larger then that of the closed-cycle as the actual usable steam produced is about 0.5% of the warm seawater used. The final disadvantage is due to the gasses that are naturally present in the seawater.** Although this type of system is beneficial for removing the salt from the pure water, **the system** also **removes the gases that are dissolved into the water including carbon dioxide and nitrogen gas. These gasses do not recondense when introduced to the cold seawater and therefore become trapped in the system. This greatly reduces efficiency** (Takahashi and Trenka, 1996).

## Offcase

### States CP: 1NC

**Text: The fifty state governments of the United States should substantially increase their investment in the development and deployment of offshore Ocean Thermal Energy Conversion technology.**

**States solve—many are supporting research into OTEC now**

Combs 8 (Susan Combs, The Energy Report: Texas Comptroller of Public Accounts May 2008, http://www.window.state.tx.us/specialrpt/energy/pdf/20-OceanPower.pdf)

**While many states are supporting research** in renewable¶ energy, only **Maine**, which **is considered to¶ have a high potential for** tidal energy, includes any¶ support for **research into ocean** (tidal) **power in its¶ eligible renewable technologies**.26 **Hawaii includes¶ both wave energy and ocean thermal conversion** in¶ its generous 100 percent tax credit for investment in¶ “high tech business.”27 The state of Texas offers no¶ subsidies or incentives for ocean power. In the U.S., Hawaii was an early location for¶ experiments with ocean power, particularly ocean¶ thermal conversion, and now **interest is growing¶ in the Northwest and the Northeast. Tidal pilot¶ projects are being considered in San Francisco¶ Bay and New York City. Wave energy is being¶ investigated in states such as Oregon, Washington,¶ Maine, Rhode Island and Florida**. FERC¶ has given approval for wave energy projects in¶ Washington and Oregon to proceed, granting a¶ preliminary permit for a demonstration of a device¶ at Reedsport, Oregon and accepting a commercial¶ license application for a project in Makah Bay,¶ Washington.28¶

**Guam CP: 1NC**

**Text: Guam should substantially increase its investment in the development and deployment of offshore Ocean Thermal Energy Conversion technology.**

**Guam can develop OTEC—consistent temperature means Guam is reliable**

**Uchida 83** (Richard N. Uchida August 1983, Southwest Fisheries Center Honolulu Laboratory National Marine Fisheries Service, NOAA in Honolulu, Hawaii, “Summary of Pertinent Biological Characteristics of Potential Ocean Thermal Energy Conversion Sites in the Pacific Ocean” page 3)

**The existence of ideal oceanographic conditions** such as consistently ¶ warm surface water and a steep submarine slope **close to shore makes OTEC a ¶ viable alternative for energy in Guam**. ¶ consistent annual mean AT difference of 23.4C0 between the surface and ¶ depths of about 854-915 m near Cabras Island and Luminao Reef (Figure 4) ¶ and that this AT could be obtained only 1.75 km offshore from the Glass ¶ Breakwater at the western tip of Luminao Reef. ¶ Lassuy (19791, demonstrated a ¶ **A review of the oceanographic information from Guam, showed that ¶ the temperature difference resource near Guam is unsurpassed** among 10 other ¶ sites examined throughout the world (Wolff 1979a, Tables 1 and 2). **Wolff ¶ found mean monthly surface temperatures consistently high year round**, ¶ ranging between 27.7O and 29.2OC. Likewise, consistently large and stable ¶ AT values were available through the year; an annual average AT greater than ¶ 20Co is available at depths of slightly less than 500 m. ¶ The major obstacle to OTEC development at Guam is the frequency of ¶ typhoons and tropical storms. Seismic activity in the Guam area also ¶ poses a threat to OTEC operations. **Wolff added that ocean currents near ¶ Guam were generally moderate in strength and varied only slightly in ¶ direction**.

### Environment DA: Links

**OTEC facilities harm oceans on multiple fronts- impingement, biocides, pollution**

**Koerner 12**

(Jacqueline Koerner, B.S. in Environmental Studies @ the University of North Carolina, 6/25/12 [Energy and the Environment-A Coastal Perspective](http://coastalenergyandenvironment.web.unc.edu/) <http://coastalenergyandenvironment.web.unc.edu/ocean-energy-generating-technologies/ocean-thermal-energy-conversion/environmental-impacts-2/> )

**Withdrawal and Discharge Water**: Given a 100MW facility, 10-20 billion gallons of warm surface water and cold water from depths around 1000 meters would be used each day. The impacts of large water volume discharge need to be studied. The discharged water would be cooler, denser, and higher in nutrients because of the differing compositions of the deep cold water the the receiving waters. Water rich in nutrients like nitrogen and phosphorus would most easily be discharged into warm, oligotrophic water lacking these nutrients. How this change in compositions would affect ecosystem dynamics could yield positive or negative outcomes. **Impingement/Entainment: Screens are installed in OTEC intake systems** to keep large debris and species from getting into the facility. However, it can be assumed **some organisms would get trapped in the intake screen** (impingement) and **organisms small enough to pass through** the intake screen **would end up trapped** in the system (entrained). Both situations may **result in the death of the organism**. **Biocides**: The **warm water in OTEC facilities requires a biocide** treatment to keep efficiency in heat exchangers high. An example of such a biocide is chlorine. While the amount of such a biocide would be low and meet the standards of the Clean Water Act, **the toxin would** still **cause** some **environmental impact. OTEC systems have cables emitting electromagnetic fields** in the process of bringing the generated electricity to shore. The **EM field could impact navigation and behavior of marine species.** The **physical platform** of the system **could attract or deter organisms**, and its mooring would pose the threat of **entanglement** to marine organisms. **OTEC facilities** would **emit** an amount of **noise pollution**.

**OTEC causes laundry list of environmental impacts**

Robin **Pelc** **and** Rod M. **Fujita** 11/**02**

(“Marine Policy” Volume 26 Issue 6 http://www.sciencedirect.com/science/article/pii/S0308597X02000453)

Though fairly benign in environmental impact compared to traditional power plants, **OTEC poses some potential environmental threats, especially if implemented on a large scale.** Data from existing electric generating stations on the coast provide insight into possible impacts of OTEC plants. These **stations** **impact the** surrounding marine **environment** mainly **through heating the water, the release of toxic chemicals, impingement of organisms on intake screens, and entrainment of small organisms by intake pipes**, all of which are concerns for OTEC. Large discharges of mixed warm and cold water would be released near the surface, creating a plume of sinking cool water. The **continual use of warm surface water and cold deepwater may**, over long periods of time, lead to **slight warming at depth and cooling at the surface** [6]. Thermal effects may be significant, as local **temperature changes** of only 3–4°C are known to **cause** high **mortality among corals and fishes**. Aside from mortality, other effects such as reduced hatching success of eggs and developmental inhibition of larvae, which lower reproductive success, may result from thermal changes [14]. **Increased nutrient loading resulting from the discharge of upwelled water could also negatively impact** naturally low-nutrient **ecosystems typical of tropical seas.**

Toxic chemicals, such as ammonia and chlorine, may enter the environment from an OTEC plant and kill local marine organisms. Ammonia in closed-cycle systems would be designed not to contact the environment, and a dangerous release would be expected to result only from serious malfunction such as a major breakdown, collision with a ship, a greater than 100-yr storm, terrorism, or major human error [6]. The impact of chlorine will likely be minimal, as it would be used at a concentration of approximately 0.02 ppm daily average, while the EPA standard for marine water requires levels lower than 0.1 ppm [6].

Impingement of large organisms and entrainment of small organisms has been responsible for the greatest mortality of marine organisms at coastal power plants thus far [14]. The magnitude of this problem depends on the location and size of the plant; however, if marine life is attracted to OTEC plants by the higher nutrient concentrations in the upwelled cold water, large numbers of organisms, including larvae or juveniles, could be killed by impingement or entrainment. For floating plants, victims of impingement would be mainly small fish, jellyfish, and pelagic invertebrates, while for land-based plants crustaceans would be the most affected [6].

Finally, a small amount of **CO2 is released to the atmosphere by OTEC power generation**. Bringing deepwater to the surface where pressure is lower allows some of the sequestered CO2 in this deepwater to outgas, especially as the water is warmed, reducing the solubility of CO2. However, this carbon emission is very minute compared to the emissions of fossil fuel plants.

### Politics DA: Links

**OTEC is unpopular**

**Friedman 3/14**

(Becca Friedman @ Ocean Energy Council “Examining The Future Of Ocean Thermal Energy Conversion**”** <http://www.oceanenergycouncil.com/examining-future-ocean-thermal-energy-conversion/> )

**Given the risks, costs, and uncertain popularity of OTEC, it seems unlikely that federal support for OTEC is forthcoming**. Jim Anderson, co-founder of Sea Solar Power Inc., a company specializing in OTEC technology, told the HPR, “**Years ago in the ’80s, there was a small [governmental] program for OTEC and it was abandoned…**That philosophy has carried forth to this day**.** **There are a few people in the D**epartment **o**f **E**nergy **who have blocked government funding for this. It’s not the Democrats, not the Republicans. It’s a bureaucratic issue.”**